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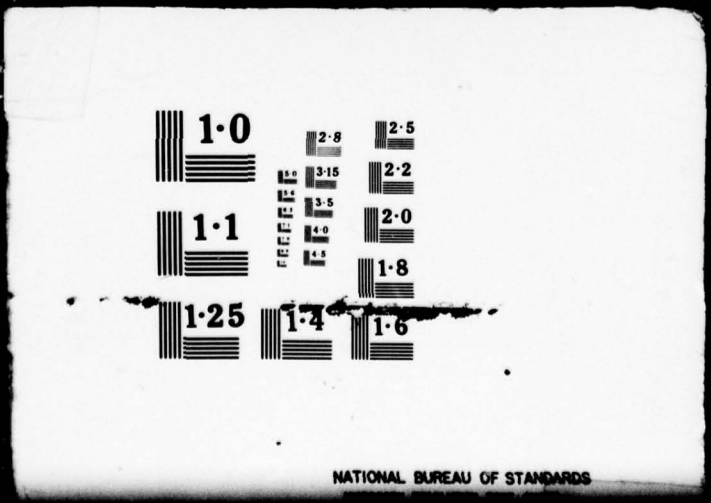

USARTL-TR-78-23G

INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFIGURATION

VOLUME VII-F - Frequency Analyses of Wake Split-Film Data, Air Ejectors With Hubcaps; Wings

Philip F. Sheridan
Boeing Vertol Company
P. O. Box 16858
Philadelphia, Pa. 19142

September 1978

Final Report for Period March 1977 - February 1978

Prepared for

APPLIED TECHNOLOGY LABORATORY
U. S. ARMY RESEARCH AND TECHNOLOGY LABORATORIES (AVRADCOM)
Fort Eustis, Va. 23604

APPLIED TECHNOLOGY LABORATORY POSITION STATEMENT

In 1975 a wind tunnel test program was conducted in the Boeing-Vertol 20-foot V/STOL Wind Tunnel on a 1/5th-scale UTTAS model to investigate and find solutions for several aerodynamic problems encountered during the UTTAS flight-testing. Specifically, these tests focused upon (a) the structure of the hub/rotor wake in the vicinity of the empennage, (b) the formulation of the ground vortex and its relation to hub loads and fuselage loads during transition, and (c) the occurrence of vibratory air pressures from the blade passing over the fuselage. Only portions of the above-mentioned wind tunnel test data were reduced and analyzed in addressing the flight-test problems of the UTTAS aircraft.

Under Contract DAAJ02-77-C-0020, Boeing-Vertol completed analyses on the data to understand more completely the aerodynamic interactions that are involved and to formulate instructions for the guidance of designers in these respects. The results of these studies are applicable to all existing and future single-rotor/tail rotor helicopters. The data have been segregated according to aerodynamic interactions and associated phenomena/problem areas. From this body of knowledge, a generalized set of design guidelines meaningful to the single-rotor helicopter design concept formulation were developed and are included in these reports.

Mr. Robert P. Smith of the Aeronautical Technology Division, Aeromechanics Technical Area, served as project engineer for this effort.

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18. SUPPLEMENTARY NOTES

Volume VII of an eight-volume report
Volume VII is comprised of seven sub-volumes (A thru G)

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Wake	Interaction	Empennage
Flow	Aerodynamic Interaction	Flow Modifier
Frequency	Flow Environment	Powered Model
Spectrum	Configuration	Air Ejector
	Hub Cap	Wing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is the sixth of seven sub-volumes of Volume VII containing spectrographs of the model helicopter hub/rotor wake as it was modified by various aerodynamic devices. This sub-volume deals with the effects of air ejector systems in configurations already possessing hub caps and also effects of several wing configurations mounted variously to alter the wake.

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PREFACE

The entire report describing the investigation of INTERACTIONAL AERODYNAMICS OF THE SINGLE-ROTOR HELICOPTER CONFIGURATION comprises eight numbered volumes bound as 33 separate documents. The complete list of these documents is as follows:

Volume I, Final Report

Volume II, Harmonic Analyses of Airframe Surface Pressure Data
- A – Runs 7-14, Forward Section
- B – Runs 7-14, Mid Section
- C – Runs 7-14, Aft Section
- D – Runs 15-22, Forward Section
- E – Runs 15-22, Mid Section
- F – Runs 15-22, Aft Section
- G – Runs 23-33, Forward Section
- H – Runs 23-33, Mid Section
- I – Runs 23-33, Aft Section

Volume III, Flow Angle and Velocity Wake Profiles in Low-Frequency Band
- A – Basic Investigations and Hubcap Variations
- B – Air Ejector Systems and Other Devices

Volume IV, One-Third Octave Band Spectrograms of Wake Split-Film Data
- A – Buildup to Baseline
- B – Basic Configuration Wake Explorations
- C – Solid Hubcaps
- D – Open Hubcaps
- E – Air Ejectors
- F – Air Ejectors With Hubcaps; Wings
- G – Fairings and Surface Devices

Volume V, Harmonic Analyses of Hub Wake

Volume VI, One-Third Octave Band Spectrograms of Wake Single Film Data
- A – Buildup to Baseline
- B – Basic Configuration Wake Exploration
- C – Hubcaps and Air Ejectors

Volume VII, Frequency Analyses of Wake Split-Film Data
- A – Buildup to Baseline
- B – Basic Configuration Wake Explorations
- C – Solid Hubcaps

This volume is

D – Open Hubcaps
E – Air Ejectors
F – Air Ejectors With Hubcaps; Wings
G – Fairings and Surface Devices

Volume VIII, Frequency Analyses of Wake Single Film Data

A – Buildup to Baseline
B – Basic Configuration Wake Exploration
C – Hubcaps and Air Ejectors

TABLE OF CONTENTS

INTRODUCTION

Volume VII presents an array of machine plotted graphs of wake angle and velocity versus frequency in the band from 4 to 240 Hz derived from the split film transducers. This encompasses data in the spectrum through 10 times rotor speed which is 1433 RPM or 23.88 Hz.

The graphs showing wake frequency spectra are sequenced in the same order as the Outline of Wake Investigations (Table I). These graphs are distributed among Volumes VII-A through VII-G by the major categories of Table I in the following arrangement:

Volume VII-A	-	Build-up to Baseline
Volume VII-B	-	Basic Configuration
Volume VII-C	-	Effect of Hub Caps Sections 1 & 2
Volume VII-D	-	Effect of Hub Caps Sections 3 & 4
Volume VII-E	-	Effect of Hub Caps Section 5 and Effect of Air Ejectors
Volume VII-F	-	Air Ejectors with Open Hub Caps and Effect of Wings and Misc. Section 1
Volume VII-G	-	Effect of Wings and Misc. Sections 2 & 3

The Table I outline and other material is included for reference and as context to the work of each sub-volume. Table 2, the List of Test Runs, arranges the runs in numerical order and gives pertinent text parameters.

The Index of Rake Positions, Table 3, lists the hot film transducer rake positions in the model coordinate system for each run and its test points. The main feature of Table 3 is the indexing of the test point number to the model water line station and butt line as it varied from run to run. The table groups the runs as they shared the indexing correspondence of point with position. It is emphasized that the runs in a group do not necessarily all share the same number of test points but they do have same correspondence within their respective ranges of test points.

The orientation of the rake is shown pictorially in Figures 1 through 6 for the various test runs. Figure 7 presents a scaled drawing of the model with reference to the three-axis coordinate system.

TABLE 1

OUTLINE OF WAKE INVESTIGATIONS

Description	Configuration Code	Run No.	Base-line
Build-up to Baseline			
1. Nacelles removed	$K_{13}+H_1-N$	149	150
2. Blades off, rotating hub	$K_{13}-M+H_{1.0}$	160	156
3. " " , non-rotating hub	$K_{13}-M+H_{1.0}$	158	156
4. " " , hub off	$K_{13}-M-H_{1.0}$	159	156
Basic Configuration			
1. Wake Explorations near Empennage			
(a) 15" Long. + traverse at T/R C.L.	K_{11}	111	---
(b) 9" Vert. + " above T/R "	"	112	---
(c) 2" " " in vortex	"	113	---
(d) 8" " " (continue 112)	"	114	---
(e) 13" " " behind stab.	"	115	---
(f) Lateral traverse, left stab. (One T.P. only)	"	116	---
(g) Same continued	"	117	---
(h) Same continued (One T.P. only)	"	118	---
(i) Lateral traverse right stab.	"	119	---
(j) T/R effect on wake	$K_{11}+T_2^0$	121	115
2. Climb/Descent Studies			
(a) Climb 900 FPM	K_{11}	135	---
(b) Descent 800 FPM	"	136	---
Effect Of Hub Caps			
1. Solid Caps on Canister			
(a) 7.6" diam. 2.17" ht. soft Pitch Arms	$K_{11}-H_{1.0}+H_{1.2}$	137	136
(b) 7.6" diam. 2.17" ht. stiff Pitch Arms	$K_{13}+H_{1.2}$	153	156
(b) 7.6" diam. 2.45" ht. flt. test config.	$K_{13}+H_{1.2.1}+I_1+E_{1.0}$	207	188

TABLE 1 (CONTINUED)

OUTLINE OF WAKE INVESTIGATIONS

Description	Configuration Code*	Run No.	Base-line
Effect of Hub Caps (Continued)			
2. Solid Caps Raised Above Canister			
(a) 7.6" diam. 2.45" ht. 70" depth, .55 gap	$H_{1.2.2}+I_1+E_{1.0}$	208	188
(b) 10.0" diam. 3.25" ht. 1.55" depth, .50" gap	$H_{1.8.1}+I_1+E_{1.0}$	189	188
(c) 10.0" diam. 4.125" ht. 2.05" depth, .875" gap	$H_{1.8.2}+I_1+E_{1.0}$	190	188
(d) Repeat of 189	" " "	210	188
3. Open Caps Without Underbody			
(a) 10.0" diam. 1.25" gap,blades	$H_{1.0.2}+I_1+E_{1.0}$	193	188/166
(b) " " " gap, no blades	$H_{1.0.1}-M$	166	158
(c) " " 2.05" gap,blades	$H_{1.14.1}+I_1+E_{1.0}$	211	188
(d) " " 1.75" gap, no blades	$H_{1.0.1}-M$	165	158
(e) " " 1.87" gap,blades	$H_{1.0.3}+I_1+E_{1.0}$	191	188
(f) 16" diam. 2.00" gap,blades	$H_{1.7.1}$	168	156/167
(g) " " " gap, no blades	$H_{1.7.1}-M$	167	158
(h) " " 4.00" gap,blades	$H_{1.7.2}$	169	156
4. Open Caps with Underbody			
(a) 7.6" diam. 1.25" gap	$H_{1.11.1}+I_2+E_{1.0}$	194	188
(b) " " " "	$H_{1.11.1}+I_2+E_{4.0}$	198	188
(c) " " " " center post	$H_{1.11.2}+I_2$	202	194
(d) 10.0" diam. .5" gap, no blades	$H_{1.5.1}-M$	164	158
(e) " " 1.25" gap, no blades	$H_{1.5.2}-M$	161	158
(f) " " 2.0" gap, no blades	$H_{1.5.4}-M$	163	158
(g) " " 4.0" gap, no blades	$H_{1.5.3}-M$	162	158
(h) " " 1.25" gap	$H_{1.5.2}$	154	156/161

*Basic Code is K13.

TABLE 1 (CONTINUED)

OUTLINE OF WAKE INVESTIGATIONS

Description	Configuration Code*	Run No.	Base-line
5. Miscellaneous Hub Covers			
(a) Hub fairing 16" diam.	$H_{1.3}$	151	150
(b) Wham-O-Frisbee 10" diam.	$H_{1.9.0}+E_{1.2}$	182	181
(c) Fab. glass Frisbee 16" diam.	$H_{1.9.1}+E_{1.2}$	183	181
Effect of Air Ejectors			
1. Basic system no blowing	$H_{1.0}+E_{1.0}$	172	156
2. " " 40 psi	" "	173	156/172
3. " " 150 psi	" "	174	156/172
4. Wide chord shroud 40 psi	$H_{1.0}+E_{2.5.1}$	175	156/173
5. Wide " " 150 psi	" "	176	156/174
6. W/C shroud w. lip 40 psi	$H_{1.0}+E_{3.5.2}$	184	156/173
7. Same Contoured Parallel 150 psi	$H_{1.0}+E_{3.5.4}$	187	156/174
8. Bifurcated duct 0 psi	$H_{1.0}+E_{5.0}$	203	156
9. " " 40 psi	" "	204	156/203
10. " " 150 psi	" "	205	156/203
Air Ejectors with Open Hub Caps with Underbodies			
1. 7.6" diam. 1.25" gap, 0 psi	$H_{1.11.1}+I_2+E_{1.0}$	194	188/172
2. " " " " 20 psi	" " "	195	188
3. " " " " 40 psi	" " "	196	188/173
4. " " " " 150 psi	" " "	197	188/174
5. " " " " 0 psi	$H_{1.11.1}+I_2+E_{4.0}$	198	188/194
6. " " " " 40 psi	" " "	199	188/196
7. " " " " 150 psi	" " "	200	188/196
8. Same with center post	$H_{1.11.2}+I_2+E_{4.6}$	201	188/200
9. 10.0" diam. 2.0" gap wide ch'd. shroud (150 psi)	$H_{1.5.4}+E_{2.5.1}$	177	156/176
Effect of Wings and Misc.			
1. Wings			
(a) Nacelle-mounted stub wing	$H_{1.0}+W_{1.0}+E_{1.1}$	178	181
(b) Single slotted flapped wing	$H_{1.0}+W_{3.0}+E_{1.0}$	180	181
(c) Dougle slotted flapped wing	$H_{1.0}+W_{2.0}+E_{1.0}$	179	181
(d) Boom-mounted stub wing	$H_{1.0}+W_{4.0}$	186	156

*Basic Code is K13.

TABLE 1 (CONTINUED)

OUTLINE OF WAKE INVESTIGATIONS

Description	Configuration Code*	Run No.	Base-line
2. Crown Fairings			
(a) Flat top behind shaft	$K_{11}+D_1$	140	138
(b) Round top behind shaft	$K_{11}+D_2$	141	138
(c) Extended flat top fairing	H_1+D_4	170	156
(d) Flat top + 16" cap, 4" gap	$H_{1.7.2}+D_4$	171	170
(e) Forward fairing/nacelle fairing	$P_{1.0}$	152	156
3. Surface Devices			
(a) Vortex generators	$K_{11}+VG_{2.1}$	139	138
(b) Guidevane between nacelles	$K_{11}+FV_1$	142	138
(c) Longitudinal strakes	$H_{1.5.3}+S_4$	155	156
(d) 14% porosity spoiler	$K_{11}+X_1$	143	138

*Basic Code is K13 unless noted otherwise.

TABLE 2

LIST OF TEST RUNS

BASIC INVESTIGATIONS OF THE HUB WAKE

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
111	K_{11}/15" Long. wake traverse at TR center line	80	1433/0	8	6.0	-2.0	∞	Off
112	" /9" Vert. wake traverse above TR center line	"	"	"	"	"	"	"
113	" /2" Vert traverse through MR vortex	"	"	"	"	"	"	"
114	" /8" Vert. traverse below TR center line	"	"	"	"	"	"	"
115	" /13" Vert. traverse behind stabilizer	"	"	"	"	"	"	"
116	" /Lateral traverse - left stabilizer	"	"	"	"	"	"	"
117	" /116 continued	"	"	"	"	"	"	"
118	" /116 continued	"	"	"	"	"	"	"
119	" /Lateral traverse - right stabilizer	"	"	"	"	"	"	"
121	$K_{11}+T_2$/Effect of tail rotor flow on wake	"	1433/ 4500	"	"	"	"	On
135	K_{11}/Wake in 900 fpm climb	"	"	"	-6.0	-4.5	"	Off
136	" /Wake in 800 fpm descent	"	"	"	6.0	-2.0	"	"

TABLE 2 (CONTINUED)
LIST OF TEST RUNS
EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
137	K_{11}-$H_{1.0}$+$H_{1.2}$/Effect of 7.6 inch diam. solid hub cap	80	1433/0	8	6	-3.8	∞	Off
138	K_{11}/Repeat of base run	"	"	"	"	"	"	"
139	K_{11}+$VG_{2.1}$/Effect of vortex generators on aft crown	"	"	"	"	"	"	"
140	K_{11}+D_1/Flat-topped "doghouse" fairing on aft crown	"	"	"	"	"	"	"
141	K_{11}+D_2/Rounded-top fairing	"	"	"	"	"	"	"
142	K_{11}+FV_1/Deflection vane on crown between nacelles	"	"	"	"	"	"	"
143	K_{11}+X_1/Variable porosity spoiler	"	"	"	"	"	"	"
149	K_{13}+H_1-N_1/Effect of nacelles off also add stiff pitch arms (K_{13})	60	1075/0	4.5	"	"	"	"
150	K_{13}+H_1/60 knot baseline	"	"	"	"	"	"	"
151	K_{13}+$H_{1.3}$/16 inch diam. helmet fairing	"	"	"	"	"	"	"
152	K_{13}+$P_{1.0}$/Pylon and intake fairings	80	1433/0	8	"	"	"	"
153	K_{13}+$H_{1.2}$/Repeat 137 with K_{13} pitch arms	"	"	"	"	"	"	"

TABLE 2 (CONTINUED)

LIST OF TEST RUNS

EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
154	$K_{13}+H_{1.5.2}$/10" open hub cap, 7" underbody, 1.25"gap	80	1433/0	8	6	-3.8	∞	Off
155	$K_{13}+H_{1.5.2}+S_4$/Same as 154 except strakes on aft crown	"	"	"	"	"	"	"
156	$K_{13}+H_{1.0}$/Baseline with K_{13},i.e., stiff pitch arms	"	"	"	"	"	"	"
158	$K_{13}-M+H_{1.0}$/Wake studies with blades off, hub not rotating	"	0/0	"	"	"	"	"
159	$K_{13}-M-H_{1.0}$/Wake studies with hub off	"	"	"	"	"	"	"
160	$K_{13}-M+H_{1.0}$/Same as 158 except hub is rotating	"	1433/0	"	"	"	"	"
161	$K_{13}-M+H_{1.5.2}$/Repeat of 154 without blades	"	0/0	"	"	"	"	"
162	$K_{13}-M+H_{1.5.3}$/Same as 161 except 4" gap	"	"	"	"	"	"	"
163	$K_{13}-M+H_{1.5.4}$/Same as 161 except 2" gap	"	"	"	"	"	"	"
164	$K_{13}-M+H_{1.5.1}$/Same as 161 except 0.5" gap	"	"	"	"	"	"	"
165	$K_{13}-M+H_{1.0.1}$/ 10" open hub cap,no underbody,same cap vert.position as Run 154	"	"	"	"	"	"	"
166	$K_{13}-M+H_{1.0.2}$/Same as 165 with cap lowered by 0.5"	"	"	"	"	"	"	"

TABLE 2 (CONTINUED)

LIST OF TEST RUNS

EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
167	K_{13}-M+$H_{1.7.1}$/16" open cap, no underbody, 2" gap	80	0/0	8	6	-3.8	∞	Off
168	K_{13}+$H_{1.7.1}$/Blades on, same cap config. as 167	"	1433/0	"	"	"	"	"
169	K_{13}+$H_{1.7.2}$/16" open cap, no underbody, 4" gap	"	"	"	"	"	"	"
170	K_{13}+$H_{1.0}$+$D_{4.0}$/Extended flat top fairing on aft crown	"	"	"	"	"	"	"
171	K_{13}+$H_{1.7.2}$+$D_{4.0}$/Same fairing as 170 same cap as 169	"	"	"	"	"	"	"
172	K_{13}+$H_{1.0}$+$E_{1.0}$(0psi)/Basic air ejector zero blowing baseline	"	"	"	"	"	"	"
173	K_{13}+$H_{1.0}$+$E_{1.0}$(40 psi)/Same as 172 with 40 psi supply	"	"	"	"	"	"	"
174	K_{13}+$H_{1.0}$+$E_{1.0}$(150 psi)/Same as 172 with 150 psi supply	"	"	"	"	"	"	"
175	K_{13}+$H_{1.0}$+$E_{2.5.1}$(40 psi)/Ejector with wide chord shroud at 40 psi	"	"	"	"	"	"	"
176	K_{13}+$H_{1.0}$+$E_{2.5.1}$(150 psi)/Same as 174 with 150 psi supply	"	"	"	"	"	"	"
177	K_{13}+$H_{1.5.4}$+$E_{2.5.1}$(150 psi)/Same as 176 with 10" cap like 163	"	"	"	"	"	"	"
178	K_{13}+$H_{1.0}$+$W_{1.0}$+$E_{1.1}$(0 psi)/Nacelle mounted wing	"	"	"	"	"	"	"

TABLE 2 (CONTINUED)

LIST OF TEST RUNS

EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
179	$K_{13}+H_{1.0}+W_{2.0}+E_{1.0}$ (0 psi)/Double slotted flapped wing	80	1433/0	8	6	-3.8	∞	Off
180	$K_{13}+H_{1.0}+W_{3.0}+E_{1.0}$ (0 psi)/Single slotted flapped wing	"	"	"	"	"	"	"
181	$K_{13}+H_{1.0}+E_{1.2}$ (0 psi)/Baseline with ejector tube moved aft	"	"	"	"	"	"	"
182	$K_{13}+H_{1.9.0}+E_{1.2}$ (0 psi)/Standard 10" frisbee	"	"	"	"	"	"	"
183	$K_{13}+H_{1.9.1}+E_{1.2}$ (0 psi)/16" fabricated frisbee	"	"	"	"	"	"	"
184	$K_{13}+H_{1.0}+E_{3.5.2}$ (40 psi)/Wide chord with lip at 40 psi	"	"	"	"	"	"	"
185	$K_{13}+H_{1.0}+E_{3.5.2}$ (150 psi)/Same as 184 with 150 psi air	"	"	"	"	"	"	"
186	$K_{13}+H_{1.0}+W_{4.0}$/Boom mounted stub wing	"	"	"	"	"	"	"
187	$K_{13}+H_{1.0}+E_{3.5.4}$ (150 psi)/Like 185 with modified shroud	"	"	"	"	"	"	"
188	$K_{13}+H_{1.0}+I_1+E_{1.0}$ (0 psi)/Baseline with I_1 instr. ring	"	"	"	"	"	"	"
189	$K_{13}+H_{1.8.1}+I_1+E_{1.0}$ (0 psi)/Solid cap, 10" diam. 3.25" height	"	"	"	"	"	"	"
190	$K_{13}+H_{1.8.2}+I_1+E_{1.0}$ (0 psi)/Same as 190 except + 4.12" height	"	"	"	"	"	"	"

TABLE 2 (CONTINUED)

LIST OF TEST RUNS

EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
191	$K_{13}+H_{1.0.2}+I_1+E_{1.0}$ (0 psi)/10" cap, no underbody, 1.87" gap	80	1433/0	8	6	-3.8	∞	Off
193	$K_{13}+H_{1.0.2}+I_1+E_{1.0}$ (0 psi)/10" cap, no underbody, 1.25" gap	"	"	"	"	"	"	"
194	$K_{13}+H_{1.11.1}+I_2+E_{1.0}$(0 psi)/7.6" cap, underbody, 1.25" gap	"	"	"	"	"	"	"
195	$K_{13}+H_{1.11.1}+I_2+E_{1.0}$(20 psi)/Same as 194 with 20 psi air	"	"	"	"	"	"	"
196	$K_{13}+H_{1.11.1}+I_2+E_{1.0}$(40 psi)/Same as 194 with 40 psi air	"	"	"	"	"	"	"
197	$K_{13}+H_{1.11.1}+I_2+E_{1.0}$(150 psi)/Same as 194 with 150 psi air	"	"	"	"	"	"	"
198	$K_{13}+H_{1.11.1}+I_2+E_{4.0}$ (0 psi)/Same as 194 except blowing tube 2" aft	"	"	"	"	"	"	"
199	$K_{13}+H_{1.11.1}+I_2+E_{4.0}$ (40 psi)/Same as 198 with 40 psi air	"	"	"	"	"	"	"
200	$K_{13}+H_{1.11.1}+I_2+E_{4.0}$ (150 psi)/Same as 198 with 150 psi air	"	"	"	"	"	"	"
201	$K_{13}+H_{1.11.2}+I_2+E_{4.0}$ (150 psi)/Same as 200 except center support cap	"	"	"	"	"	"	"
202	$K_{13}+H_{1.11.2}+I_2$/Baseline with I_2 and no blowing tube	"	"	"	"	"	"	"
203	$K_{13}+H_{1.0}+E_{5.0}$(0 psi)/Bifurcated air duct baseline	"	"	"	"	"	"	"

TABLE 2 (CONTINUED)

LIST OF TEST RUNS

EVALUATION OF WAKE-ALTERING DEVICES

RUN NO.	CONFIGURATION/CONDITION	V_{TUN} KNOTS	RPM MR/TR	DISK LDG. psf	MODEL ANGLES		MR HT.	TAIL ROTOR
					α°	ψ°	h/d	
204	$K_{13}+H_{1.0}+E_{5.0}$ (150 psi)/Bifurcated duct with 150 psi air	80	1433/0	8	6	-3.8	∞	Off
205	$K_{13}+H_{1.0}+E_{5.0}$ (40 psi)/Same as 204 with 40 psi air	"	"	"	"	"	"	"
207	$K_{13}+H_{1.2.1}+I_1+E_{1.0}$ (0 psi)/7.6" solid cap, no gap	"	"	"	"	"	"	"
208	$K_{13}+H_{1.2.2}+I_1+E_{1.0}$ (0 psi)/Same as 207 except 0.55" gap	"	"	"	"	"	"	"
210	$K_{13}+H_{1.15.1}+I_1+E_{1.0}$ (0 psi)/Repeat of 189	"	"	"	"	"	"	"
211	$K_{13}+H_{1.14.1}+I_1+E_{1.0}$ (0 psi)/Like 189 and 210 except cap is open	"	"	"	"	"	"	"

TABLE 3

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
111	20	53.5	103.1	-7.25	1
	21	"	"	"	
	22	"	105.0	"	
	24	"	107.0	"	
	26	"	109.0	"	
	28	"	111.0	"	
	30	"	112.9	"	
	32	"	114.9	"	
	34	"	116.9	"	
	36	"	118.9	"	
112	2	48.9	107.3	-7.25	1
	4	50.8	"	"	
	6	52.7	103.3	"	
	8	54.5	"	"	
	10	56.2	"	"	
	12	57.2	"	"	
113	2	51.7	103.3	-3.25	1
	4	52.3	"	"	
	6	52.8	"	"	
	8	53.3	"	"	
	10	53.9	"	"	
	11	53.3	"	"	
114	2	44.5	103.0	-3.25	1
	4	46.4	"	"	
	6	48.2	"	"	
	8	50.0	"	"	
	10	51.9	"	"	
115	3	52.9	124.7	-3.25	1
	4	52.0	"	"	
	6	50.0	"	"	
	9	48.0	"	"	
	10	46.0	"	"	
	12	44.1	"	"	
	14	42.1	"	"	
	16	53.0	"	"	
	18	54.0	"	"	
	20	55.0	"	"	

TABLE 3 (CONTINUED)

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
116	7	36.9	100.5	-17.5	1
117	2	37.6	100.5	-16.0	1
	4	"	"	-14.0	
	6	37.3	99.6	-12.0	
	8	"	"	-10.0	
	10	"	"	- 8.0	
118	2	37.6	100.5	- 6.0	1
119	2	37.3	99.6	+ 6.0	1
	5	"	"	8	
	8	"	"	10	
	9	"	"	"	
	14	"	"	14	
	16	"	"	16	
	20	51.5	102.5	17.5	
	25	52.3	101.7	-17.5	
121	3	62.9	129.0	+ 5.7	2
	4	53.5	"	"	
	6	50.1	"	"	
	8	46.0	"	"	
	10	42.1	"	"	
135	2	56.9	106.3	- 5.7	3
	4	54.5	"	"	
	6	52.5	"	"	
	8	50.5	"	"	
	10	48.5	"	"	
	12	46.5	"	"	
	14	44.5	"	"	
136	2	56.5	104.0	- 8.0	4
	4	54.5	"	"	
	6	52.5	"	"	
	8	50.6	"	"	
	10	48.5	"	"	
	12	46.5	"	"	
	14	44.5	"	"	
	17	37.1	"	"	
	18	39.0	"	"	
	19	41.0	"	"	

TABLE 3 (CONTINUED)

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
137	3	38.7	98.4	- 8.0	5
	5	39.9	"	"	
	7	42.0	100.5	"	
	9	44.0	"	"	
	11	46.0	103.6	"	
	13	48.0	"	"	
	15	50.0	"	"	
	17	52.0	"	"	
	19	54.0	"	"	
138-41, 143	2	38.8	98.4	- 8.0	5
	3	40.0	"	"	
	4	42.0	100.5	"	
	5	44.0	"	"	
	6	46.0	103.6	"	
	7	48.0	"	"	
	8	50.0	"	"	
	9	52.0	"	"	
	10	54.0	"	"	
142	7	37.8	98.4	- 8.0	5
	8	"	"	"	
	9	40.2	"	"	
	10	42.0	100.5	"	
	11	44.0	"	"	
	12	46.0	103.6	"	
	13	48.0	"	"	
	14	50.0	"	"	
	15	52.0	"	"	
	16	54.0	"	"	
	17	56.8	"	"	

TABLE 3 (CONTINUED)

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
149-151	2	38.8	98.5	- 8.0	5
	3	40.0	"	"	
	4	42.0	100.6	"	
	5	44.0	"	"	
	6	46.0	103.5	"	
	7	48.0	"	"	
	8	50.0	"	"	
	9	52.0	"	"	
	10	54.0	"	"	
152-6, 158 161-4, 166 167, 169-71 175, 177-9 180,182,184 186-8, 190 191,193,194 196,198,201 204,207,208 211	2 3 4 5 6 7 8 9	42.9 44.9 46.9 48.9 50.9 52.9 54.9 56.9	97.9 " 100.6 " 104.6 " " "	0.0 " " " " " " "	6
159	1	54.9	104.6	0.0	6
	2	52.9	"	"	
	3	50.7	"	"	
	4	48.6	100.6	"	
	5	46.7	"	"	
160,203	5	42.9	97.9	0.0	6
	6	44.9	"	"	
	7	46.9	100.6	"	
	8	48.9	"	"	
	9	50.9	104.6	"	
	10	52.9	"	"	
	11	54.9	"	"	
165	3	44.9	97.9	0.0	6
	4	42.9	"	"	
	5	46.9	100.6	"	
	6	48.9	"	"	
	7	50.9	104.6	"	
	8	52.9	"	"	

TABLE 3 (CONTINUED)

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
168, 183	4	42.9	97.9	0.0	6
	5	44.9	"	"	
	6	46.9	100.6	"	
	7	48.9	"	"	
	8	50.9	104.6	"	
	9	52.9	"	"	
	10	54.9	"	"	
172	3	42.9	97.9	0.0	6
	4	44.9	"	"	
	6	44.9	"	"	
	7	46.9	100.6	"	
	8	48.9	"	"	
	9	50.9	104.6	"	
	10	52.9	"	"	
	11	54.9	"	"	
173,174,176	1	42.9	97.9	0.0	6
185,195,197	2	44.9	"	"	
199,200,205	3	46.9	100.6	"	
210	4	48.9	"	"	
	5	50.9	104.6	"	
	6	52.9	"	"	
	7	54.9	"	"	
181	2	42.9	97.9	0.0	6
	3	44.9	"	"	
	4	46.9	100.6	"	
	5	48.9	"	"	
	6	50.9	104.6	"	
	7	52.9	"	"	
	9	54.9	"	"	
	10	"	"	"	
	11	"	"	"	
	12	"	"	"	
	13	42.9	97.9	"	

TABLE 3 (CONTINUED)

INDEX TO RAKE POSITIONS

RUN NUMBER	TEST POINT	WATER LINE	MODEL STATION	BUTT LINE	LOCATION FIGURE
189	29	42.9	97.9	0.0	6
	30	44.9	"	"	
	31	46.9	100.6	"	
	32	48.9	"	"	
	33	"	"	"	
	34	50.9	104.6	"	
	35	"	"	"	
	36	48.9	100.6	"	
	37	50.9	104.6	"	
	38	52.9	"	"	
	39	54.9	"	"	
202	3	43.4	97.9	0.0	6
	4	44.9	"	"	
	5	46.9	100.6	"	
	6	48.9	"	"	
	7	50.9	104.6	"	

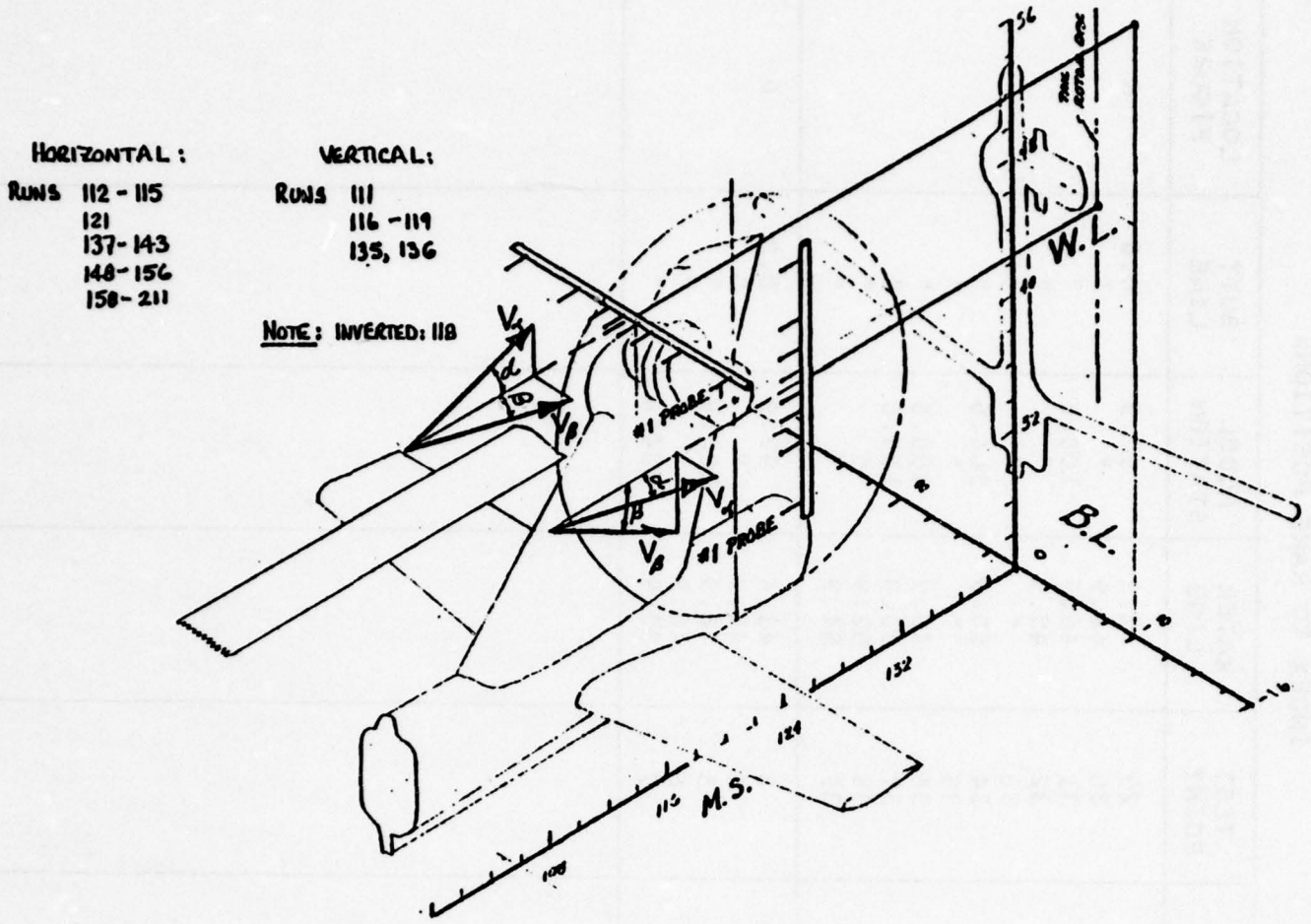


FIGURE 1 - RAKE ORIENTATION DIAGRAM

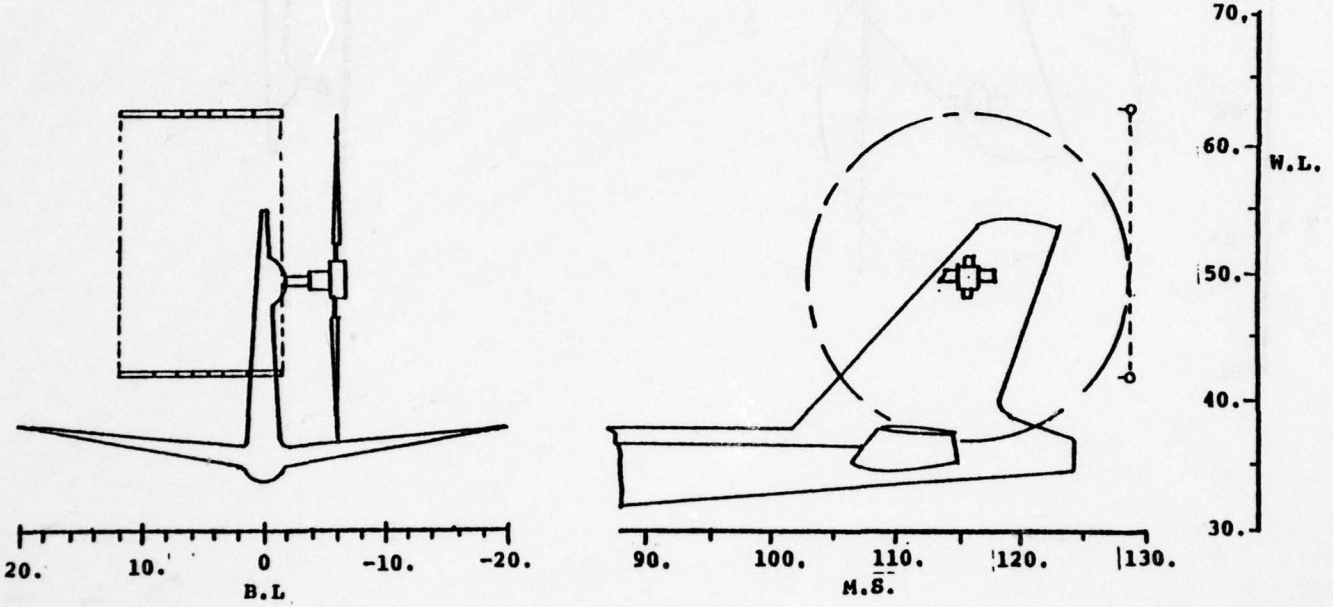


FIGURE 2 -HOT FILM RAKE LOCATIONS

RUN 135

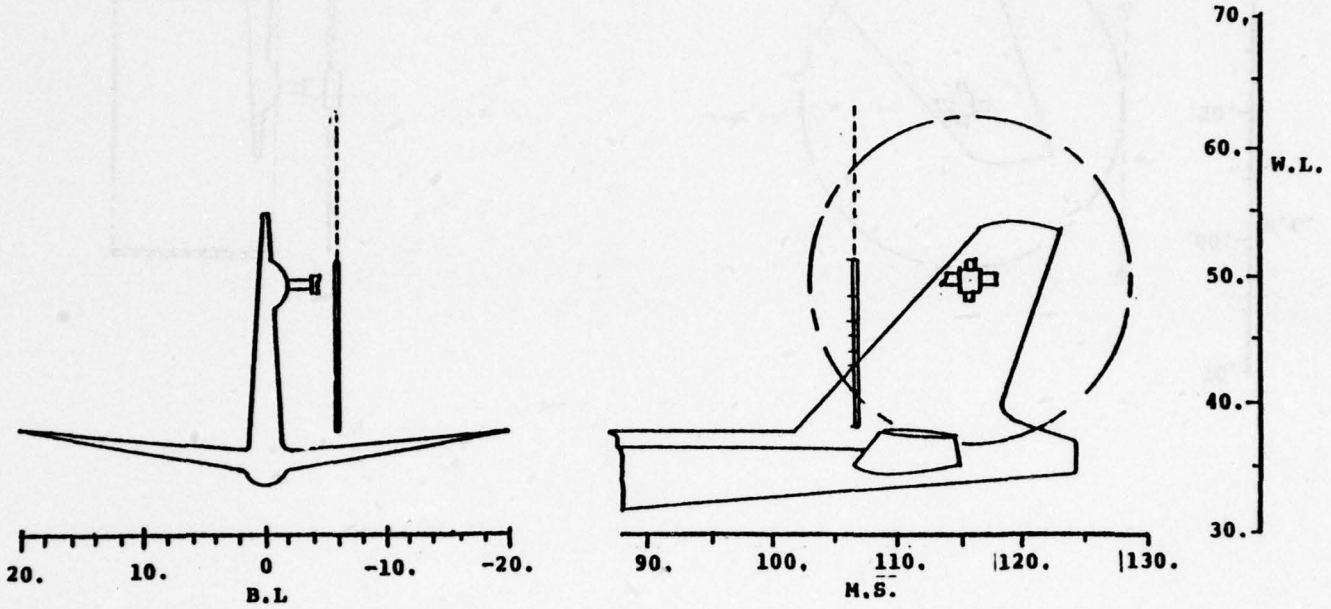


FIGURE 3 -HOT FILM RAKE LOCATIONS

RUN 136

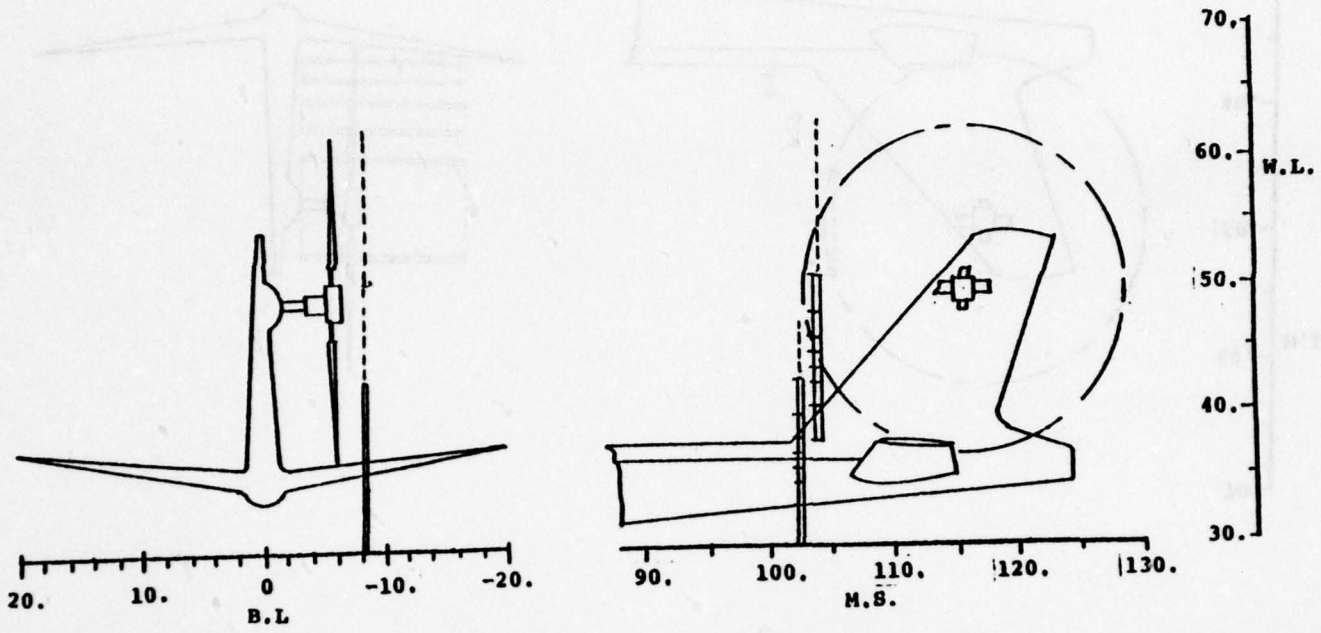


FIGURE 4 -HOT FILM RAKE LOCATIONS

RUN 137, 138, 139, 140, 141, 142,
143, 148, 149, 150, 151

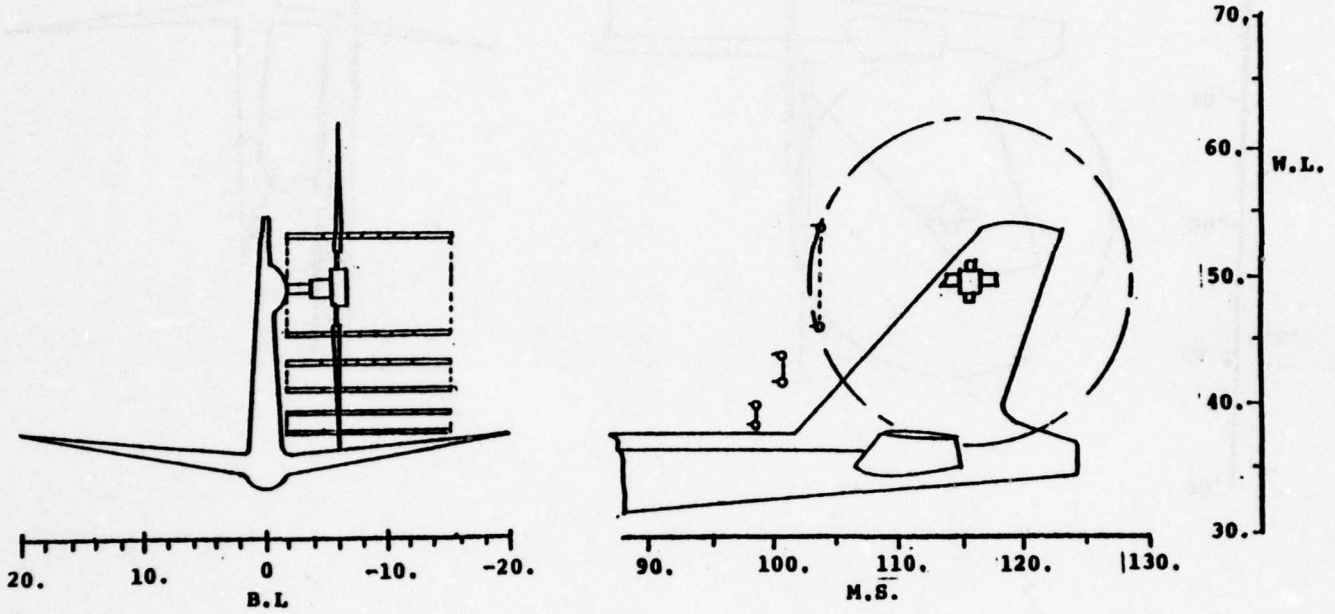


FIGURE 5 -HOT FILM RAKE LOCATIONS

RUN 152-156, 158-211

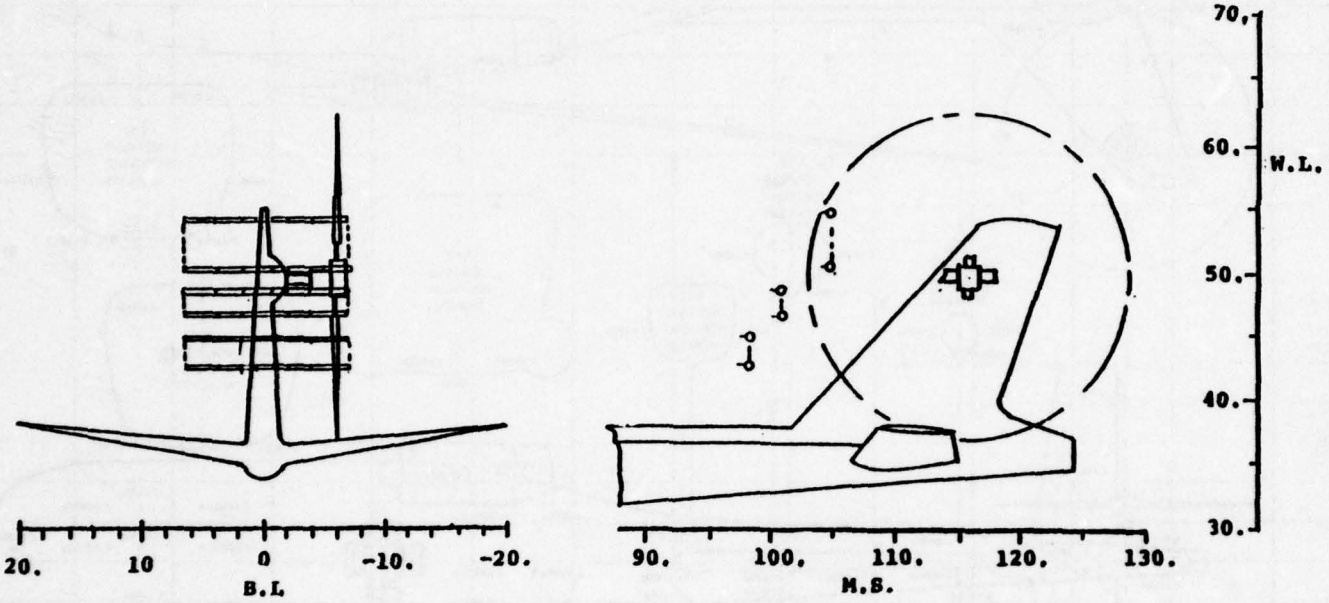


FIGURE 6 -HOT FILM RAKE LOCATIONS

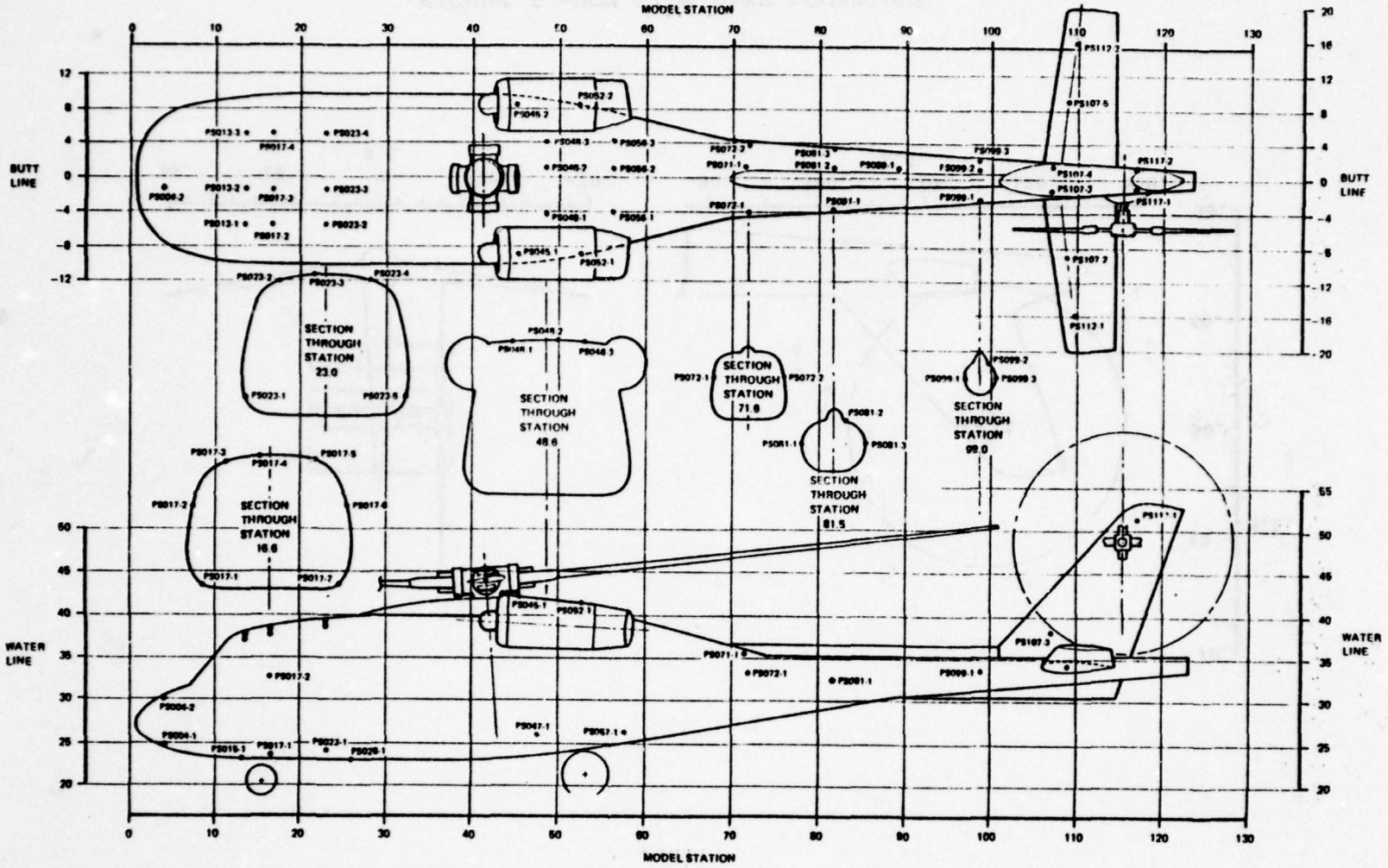
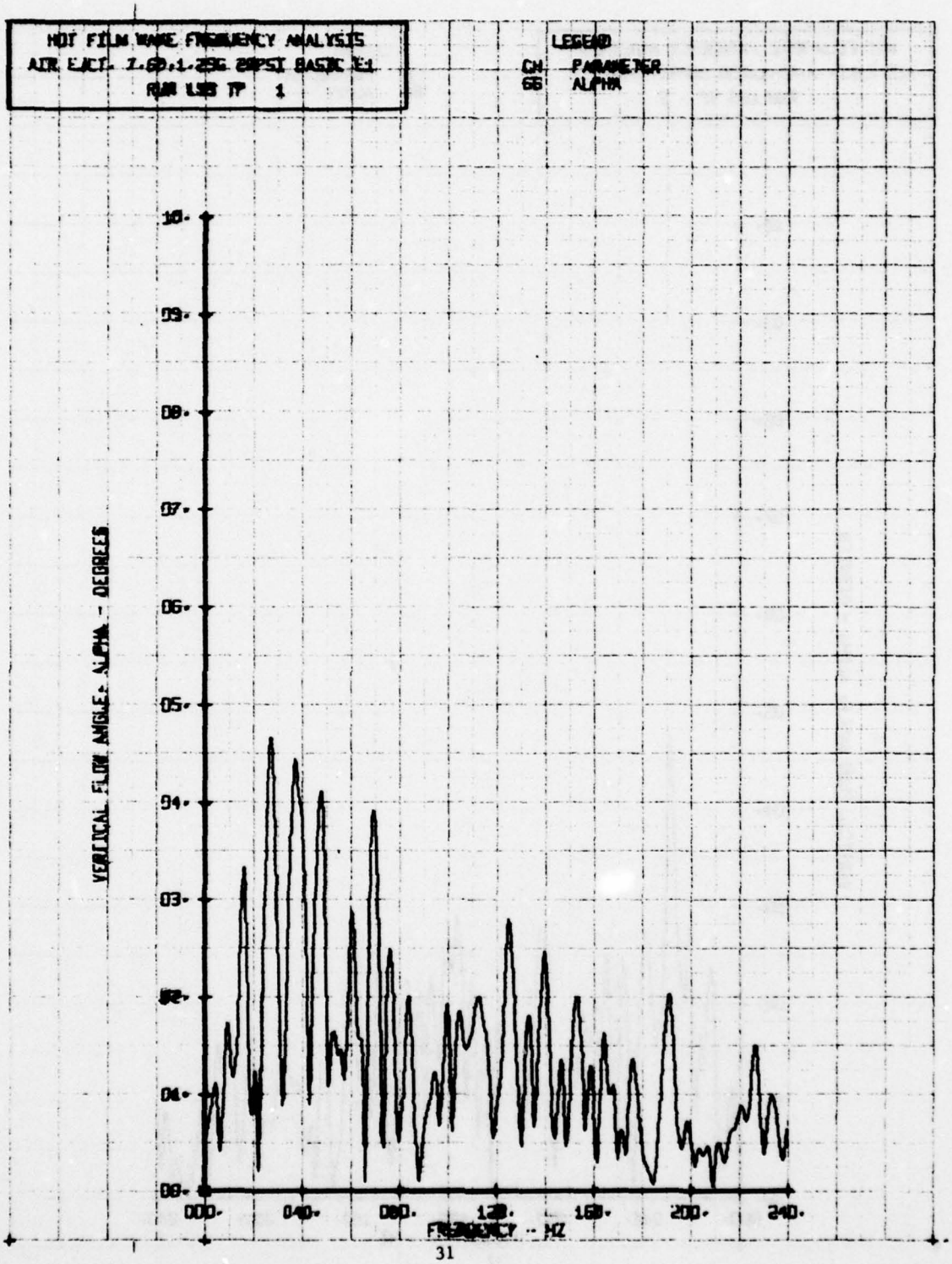
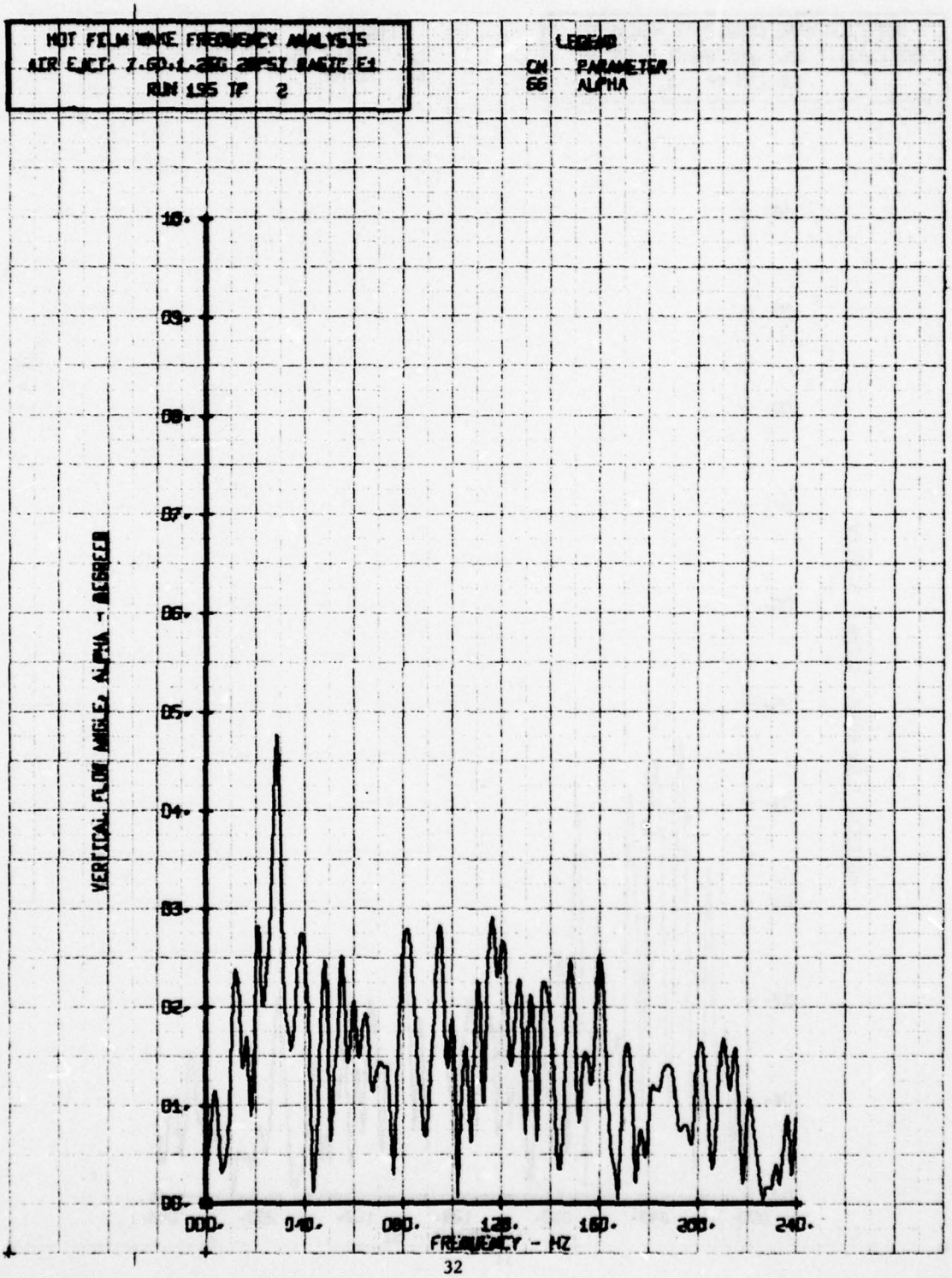
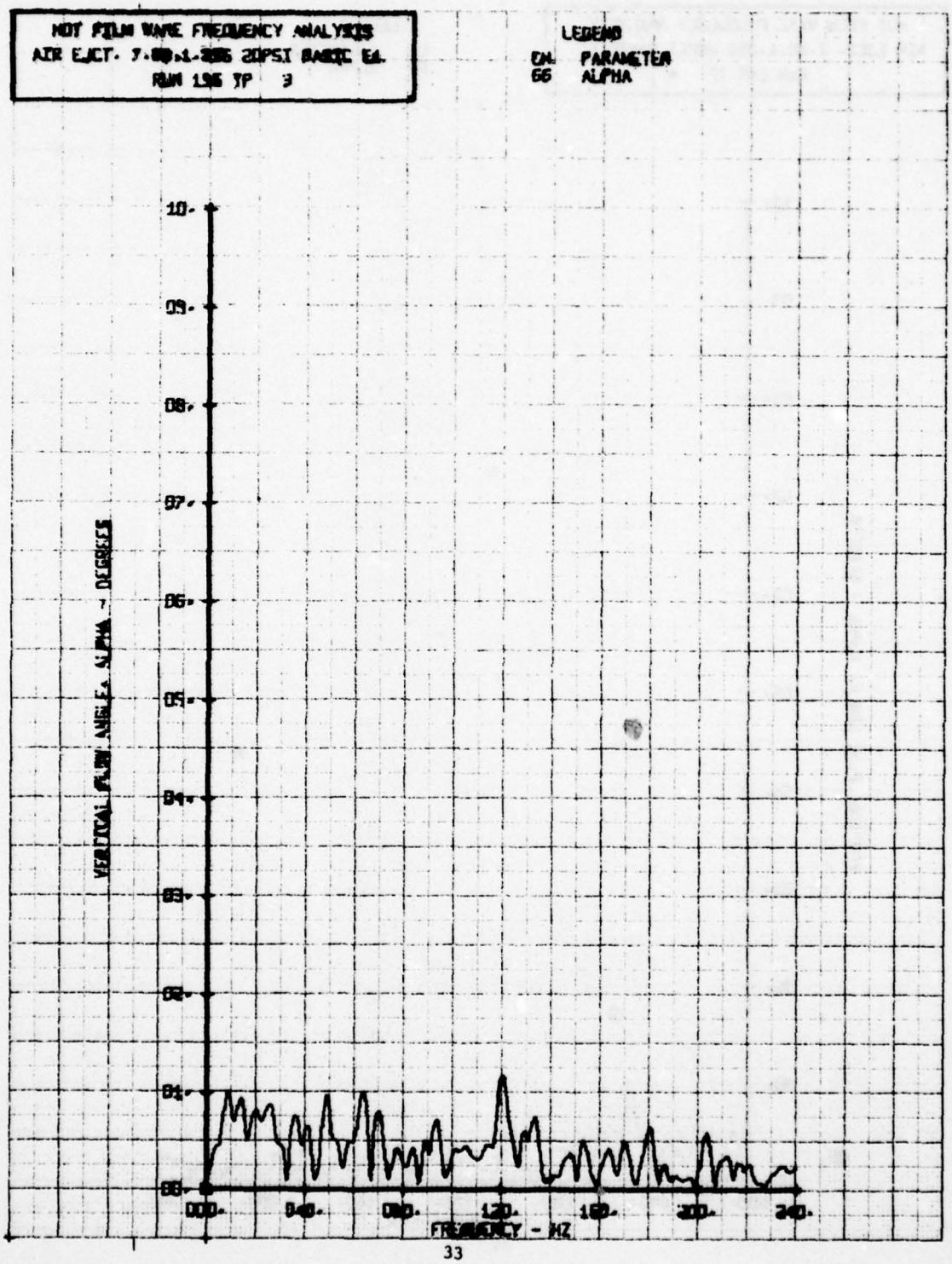
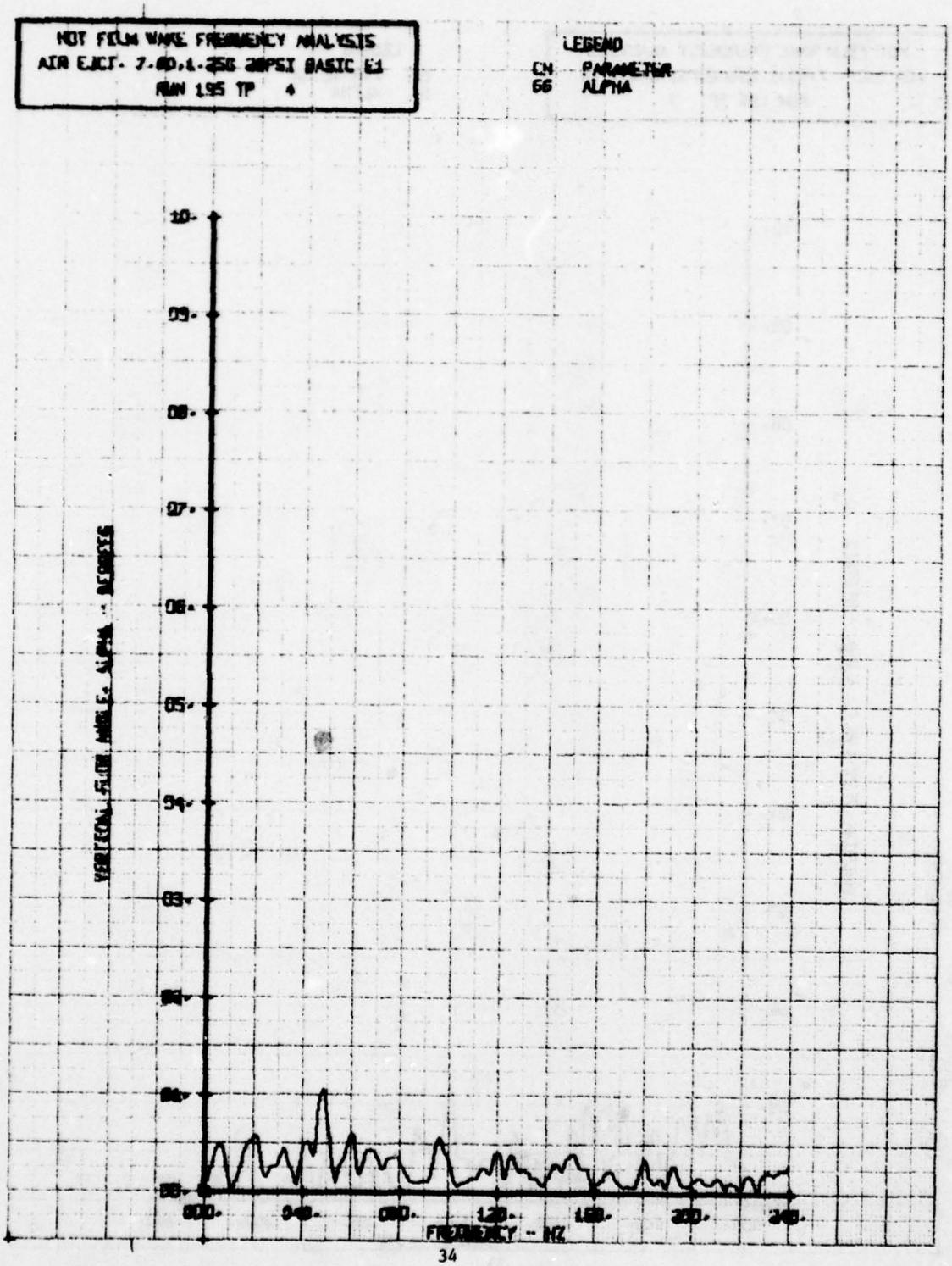


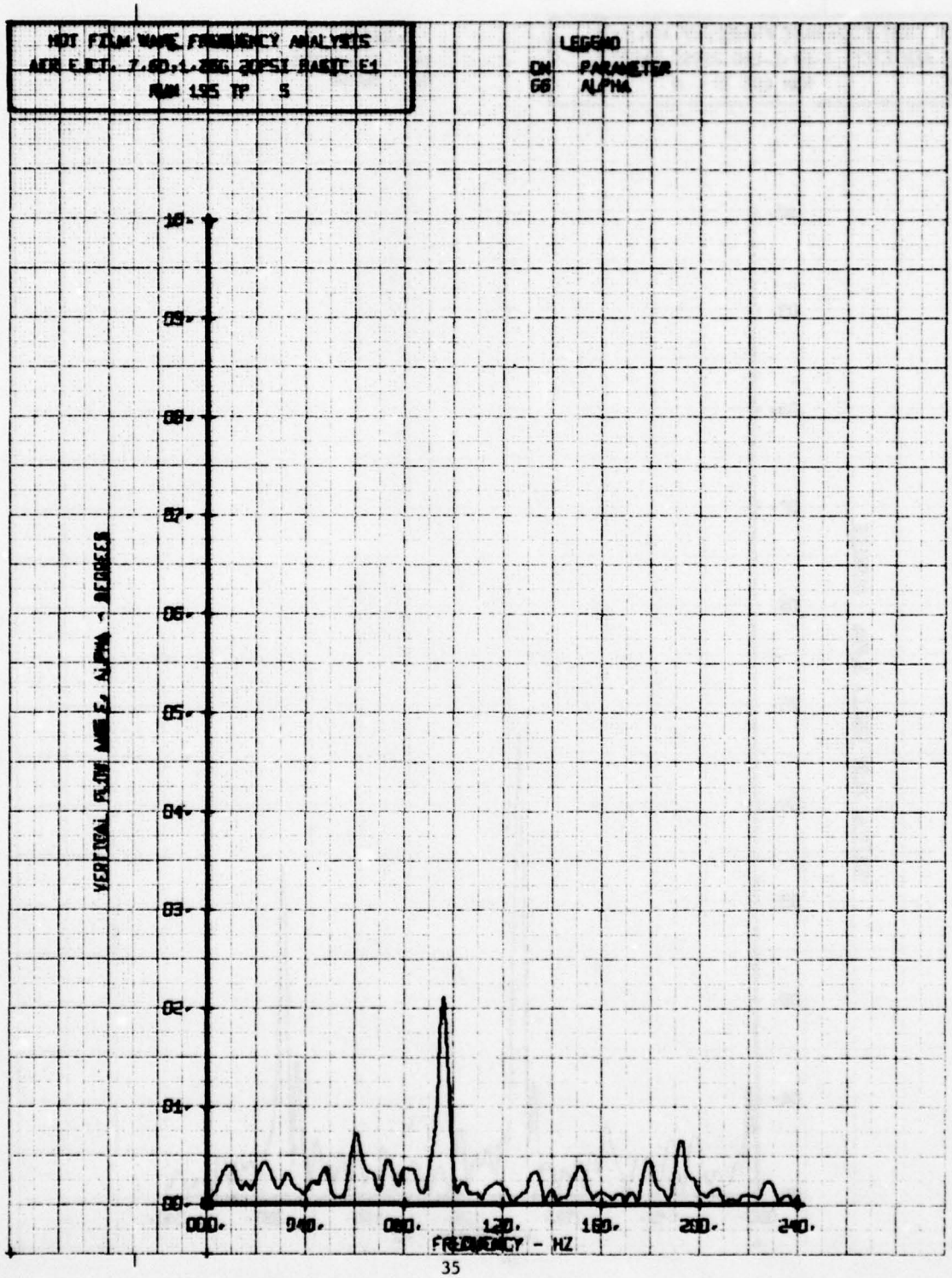
FIGURE 7 -1/4.85 SCALE MODEL GEOMETRY AND SURFACE PRESSURE TRANSDUCER LOCATIONS

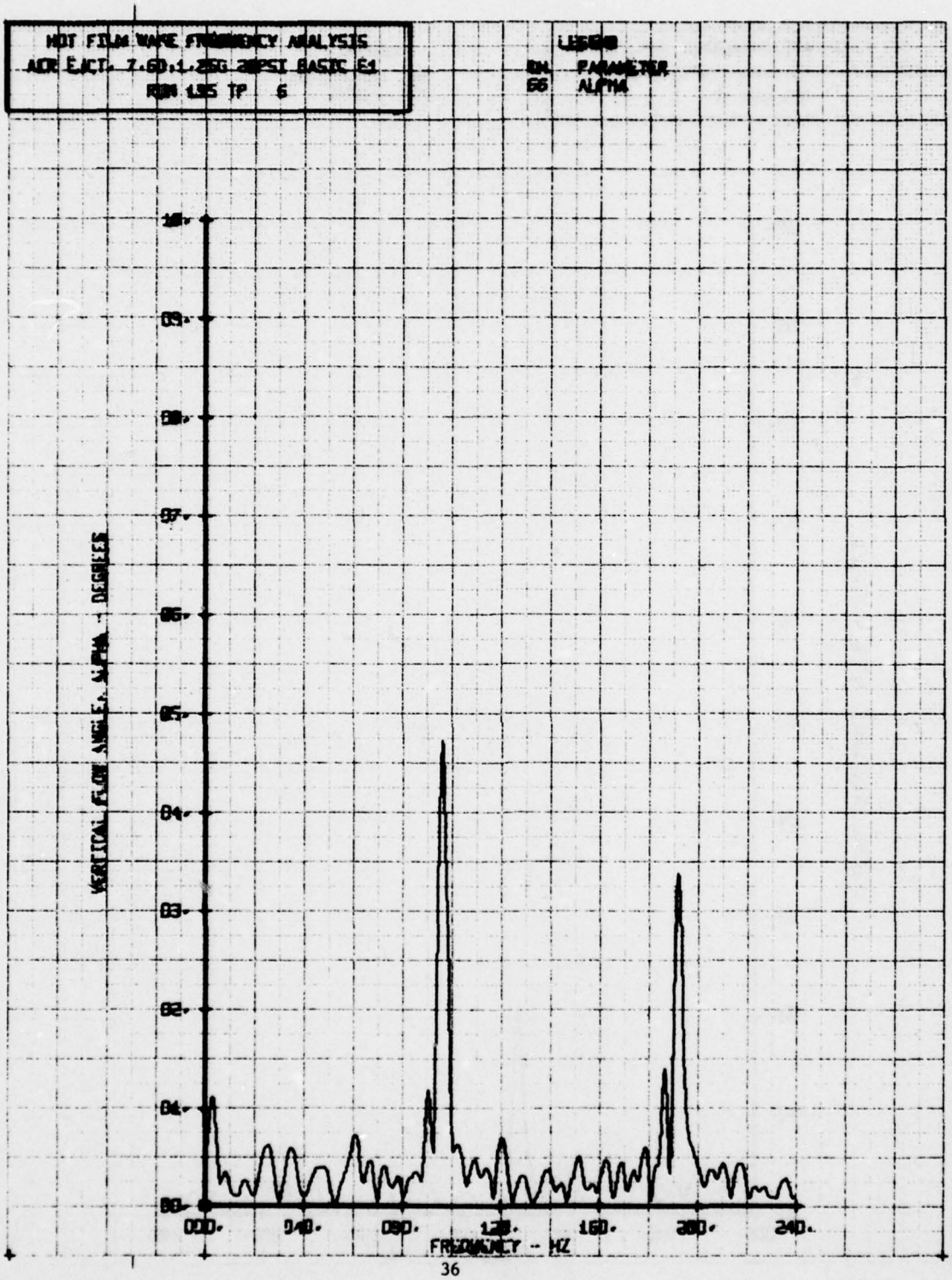

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 1.60,1.25G 25PSI BASIC E1
RUN USB TP 1
LEGEND
CH PARAMETER
66 ALPHA
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
000.
040.
080.
120.
160.
200.
240.
VERTICAL FLOW ANGLE: ALPHA - DEGREES
FREQUENCY - HZ

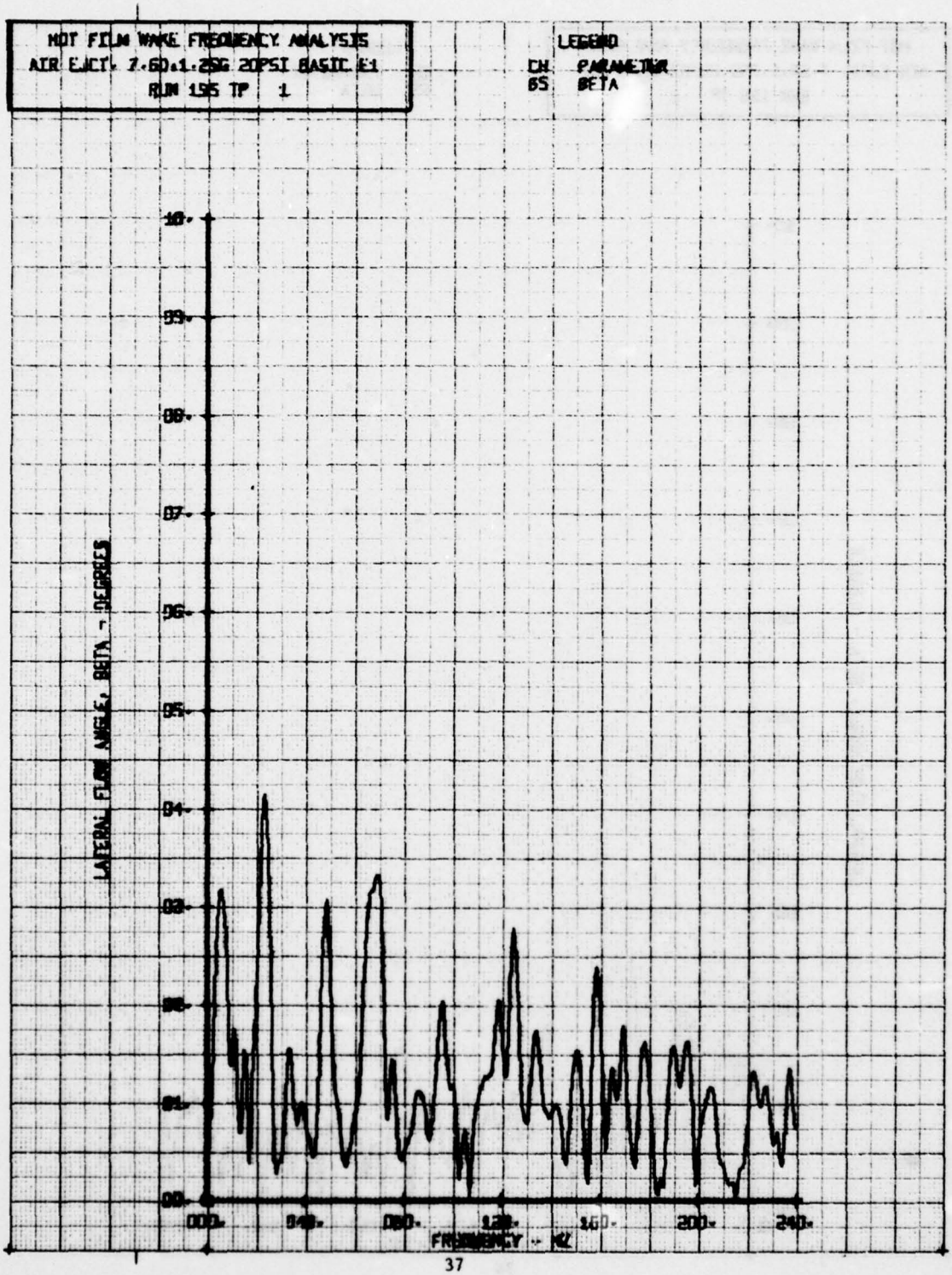

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 2.6D.1.3G 20PSI BASIC E1
RUN 195 TP 2
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ

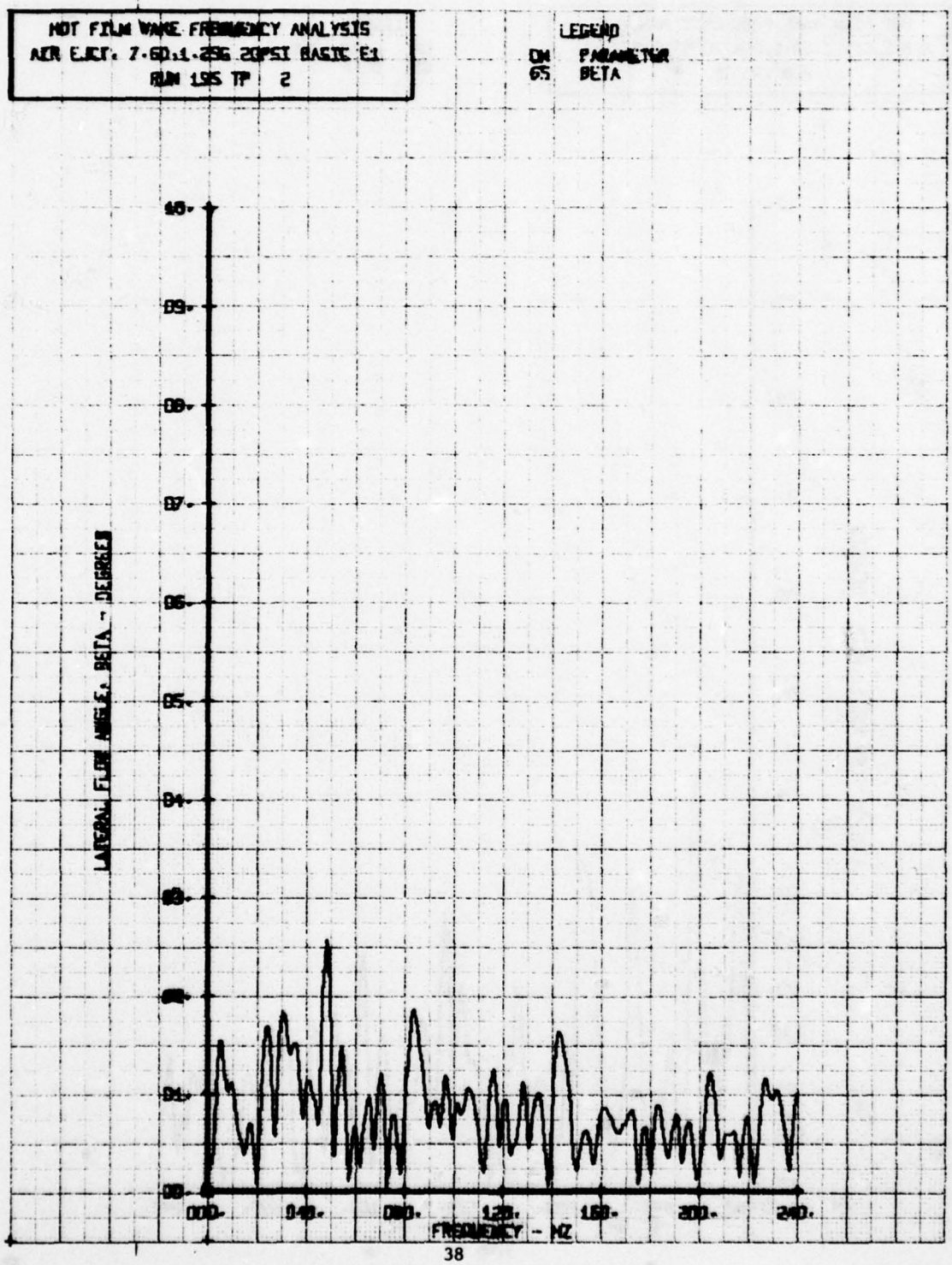

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.00.1-385 20PSI BASIC E4.
RUN 196 TP 3
LEGEND
CH. PARAMETER
66 ALPHA
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
VERTICAL FLOW ANGLE-ALPHA - DEGREES
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ

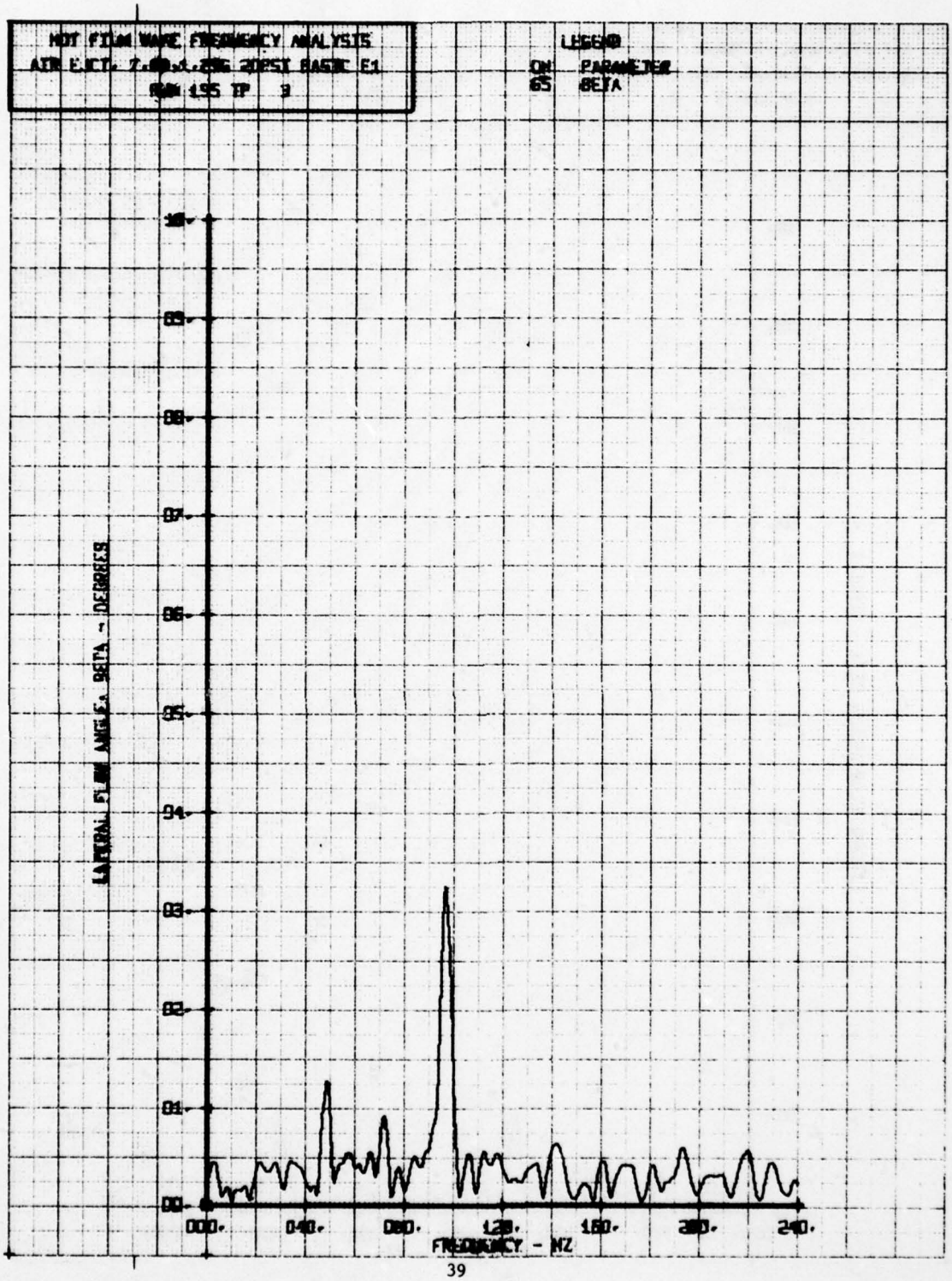

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7.0D,1.25S 20PSI BASIC E1
RUN 195 TP 4
LEGEND
CN PARAMETER
66 ALPHA
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ

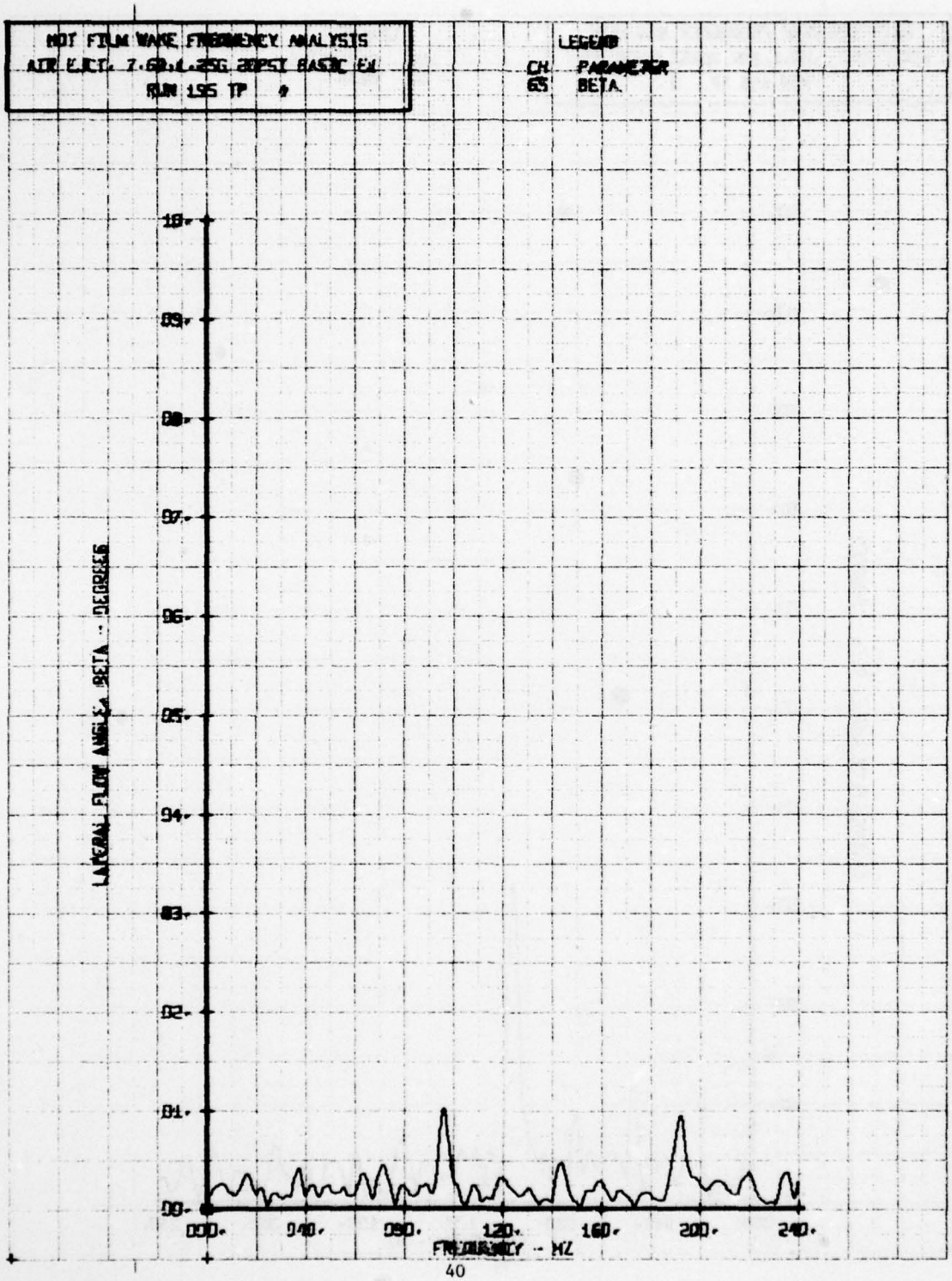

HOT FILM WAKE FREQUENCY ANALYSIS
AER E.JCT. 7.6D.1.2DG 20PSI BASIC E1
RUN 195 TP 5
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ

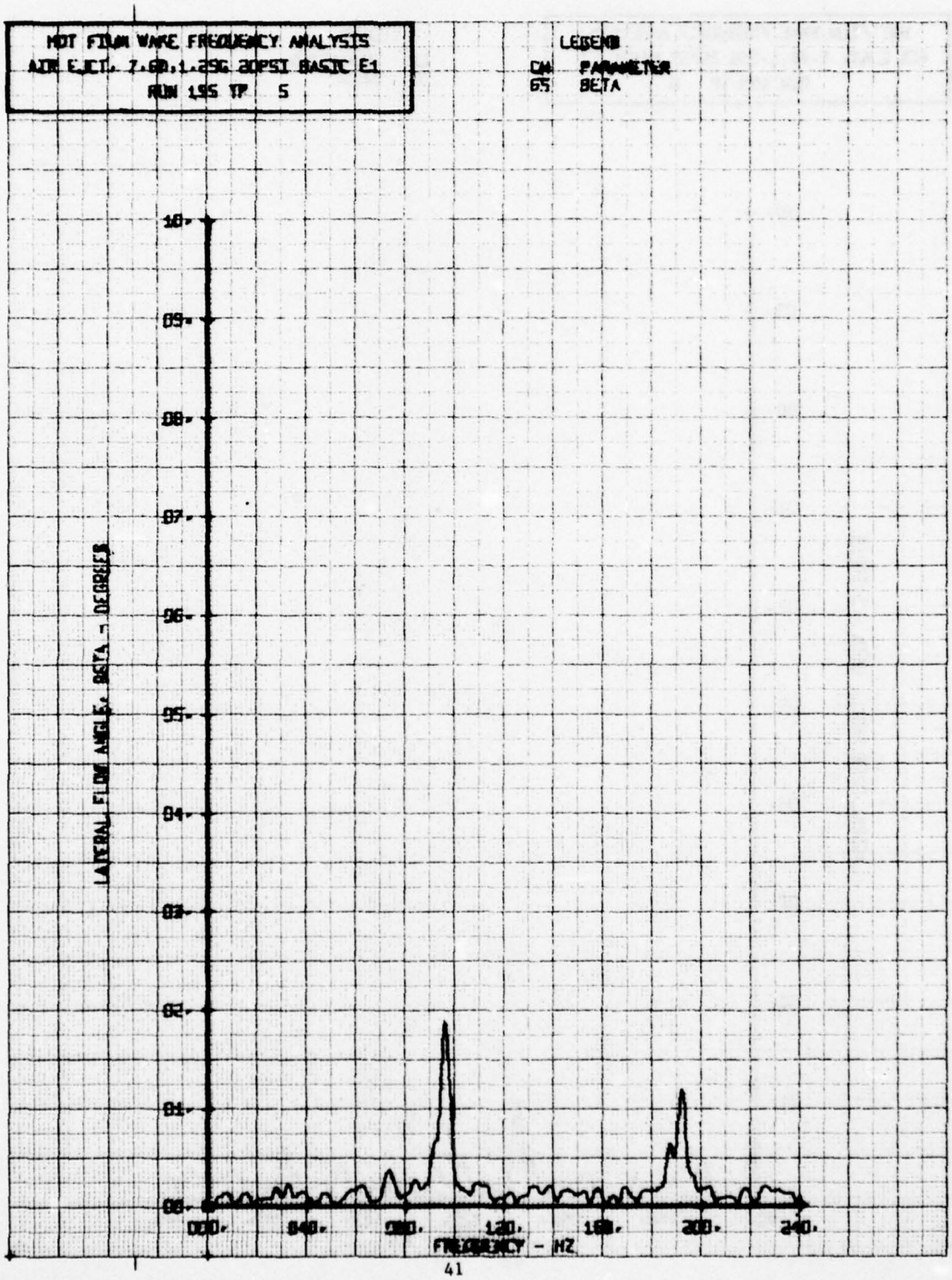

HOT FILM WAKE FREQUENCY ANALYSIS
AER E.ACT. 7.6D.1.25G 20PSI BASIC E1
RUN 185 TP 6
USER0
RN PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ

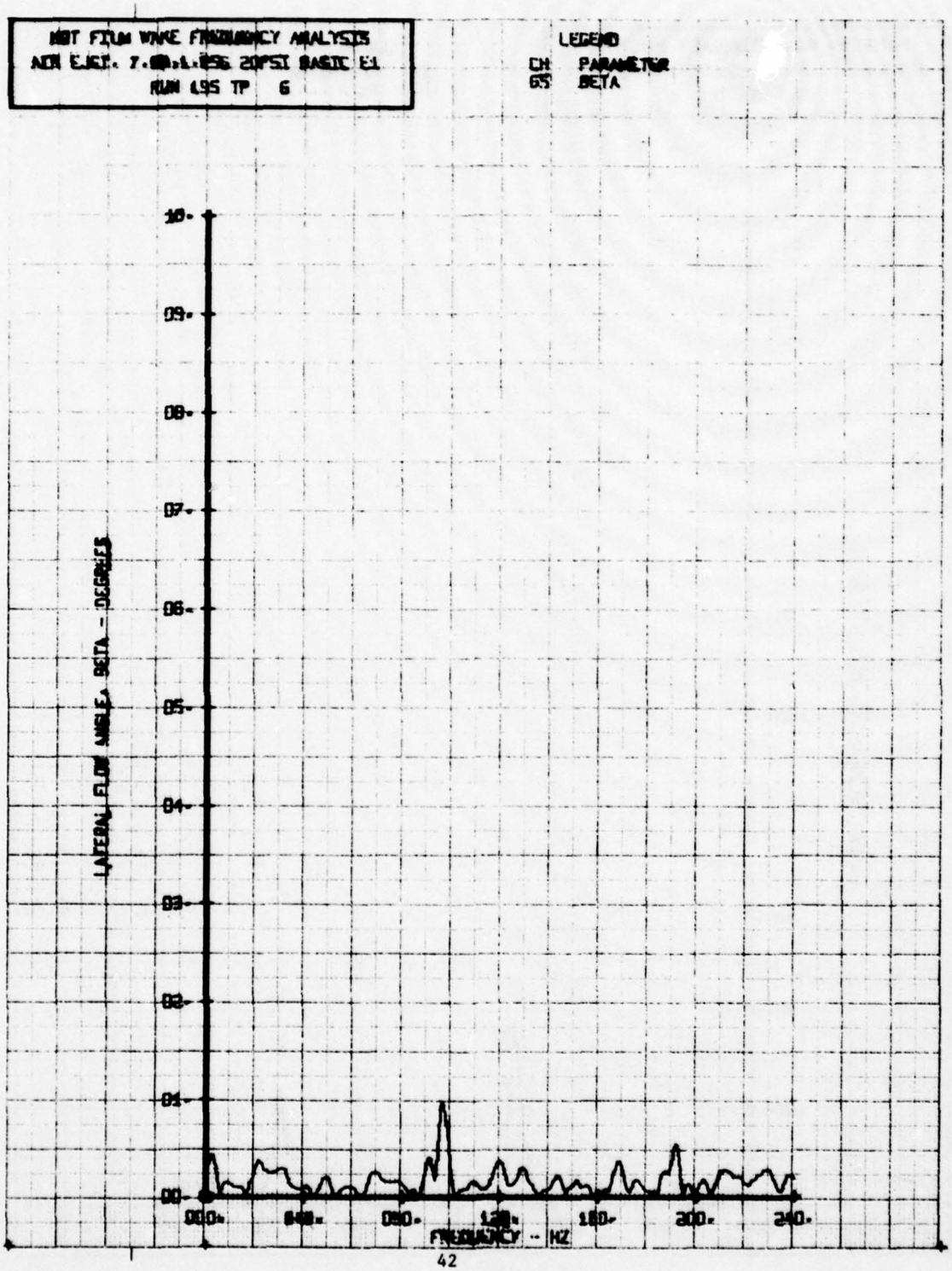

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT 7.6D.1.25G 20PSI BASIC E1
RUN 155 TP 1
LEGEND
CH PARAMETER
85 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ

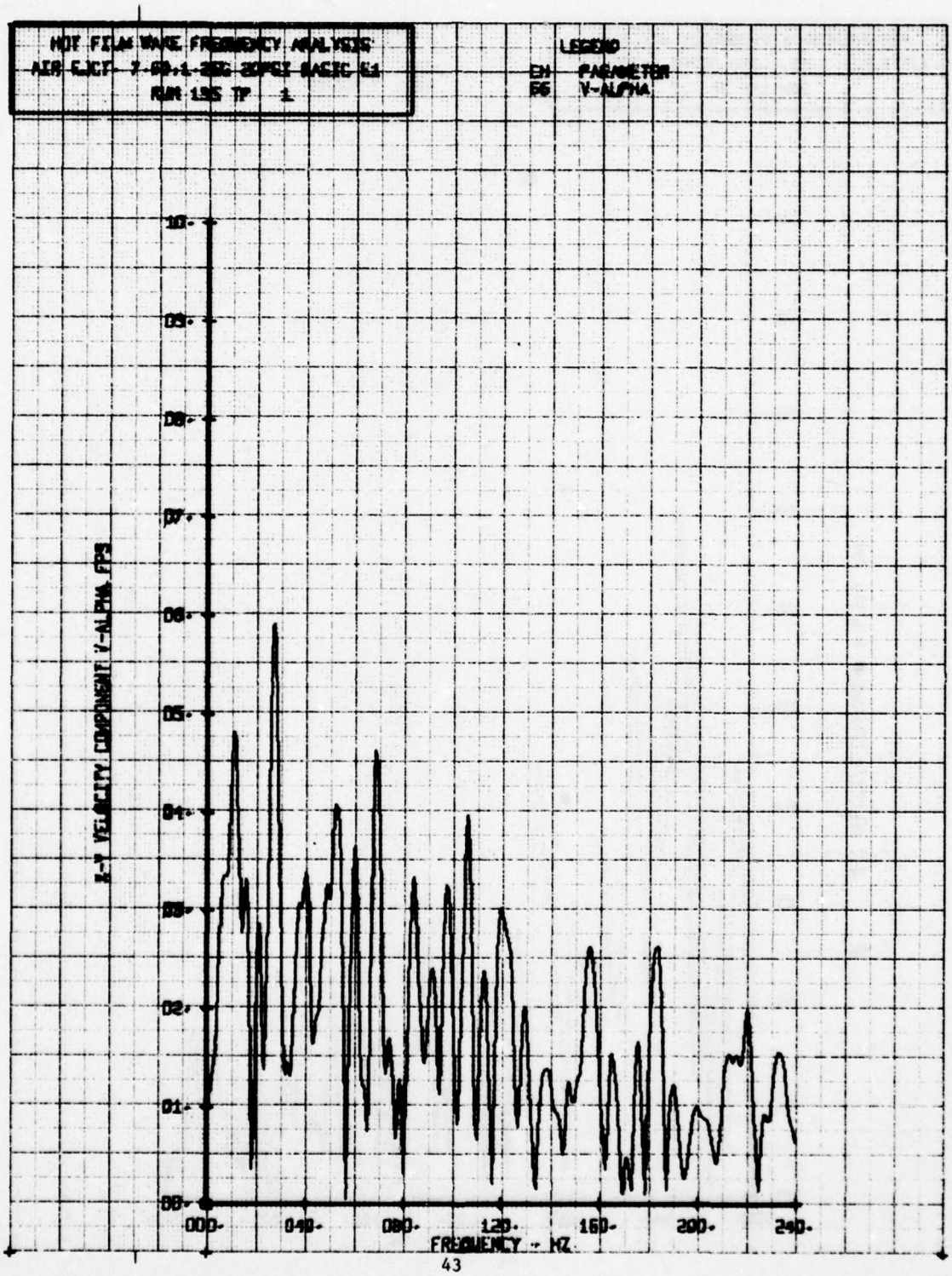

HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60:1.256 20PSI BASIC E1
RUN 195 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
RUN 155 TP 3
LEGEND
ON PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR E.N.T. 7.60.1.25G 20PSI BASIC EX
RUN 155 TP 9
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA -- DEGREES
FREQUENCY - HZ
000.
040.
080.
120.
160.
200.
240.


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.25G 20PSI BASIC E1
RUN 155 TP 5
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AEH E.ET. 7.0.1.856 20PSI BASIC E1
RUN 495 TP 6
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
09.
08.
07.
06.
05.
04.
03.
02.
01.
00.
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-60.1-30G 20PSI BASIC G1
RUN 135 TP 1
LEGEND
EH PARAMETER
F6 V-ALPHA
10.
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X-Y VELOCITY COMPONENT V-ALPHA, FPS
000.
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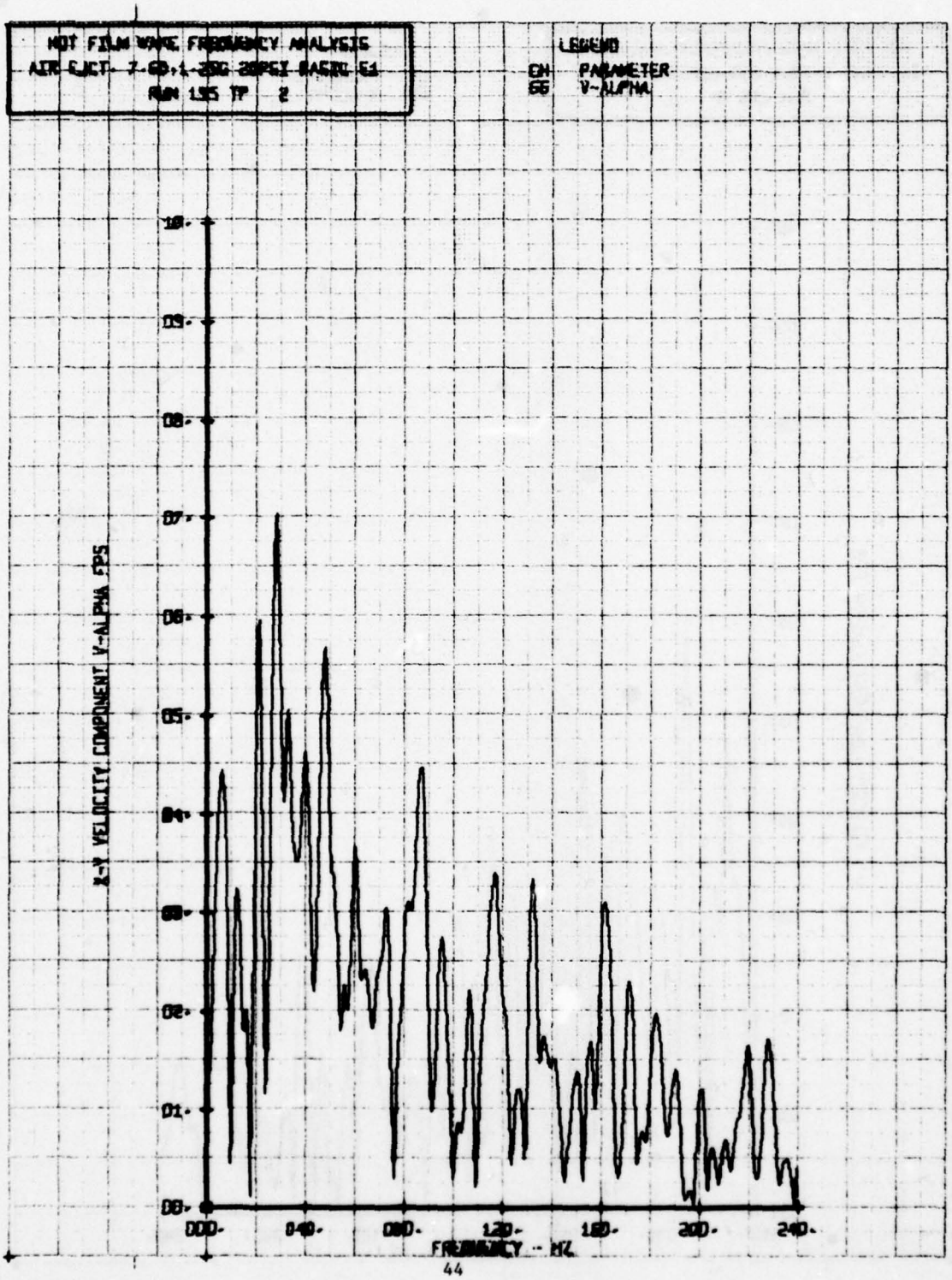
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-60,1-20G 20PSI BASIC 61
RUN 195 TP 2
LEGEND
CH PARAMETER
66 V-ALPHA
X-Y VELOCITY COMPONENT V-ALPHA FPS
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03.
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040.
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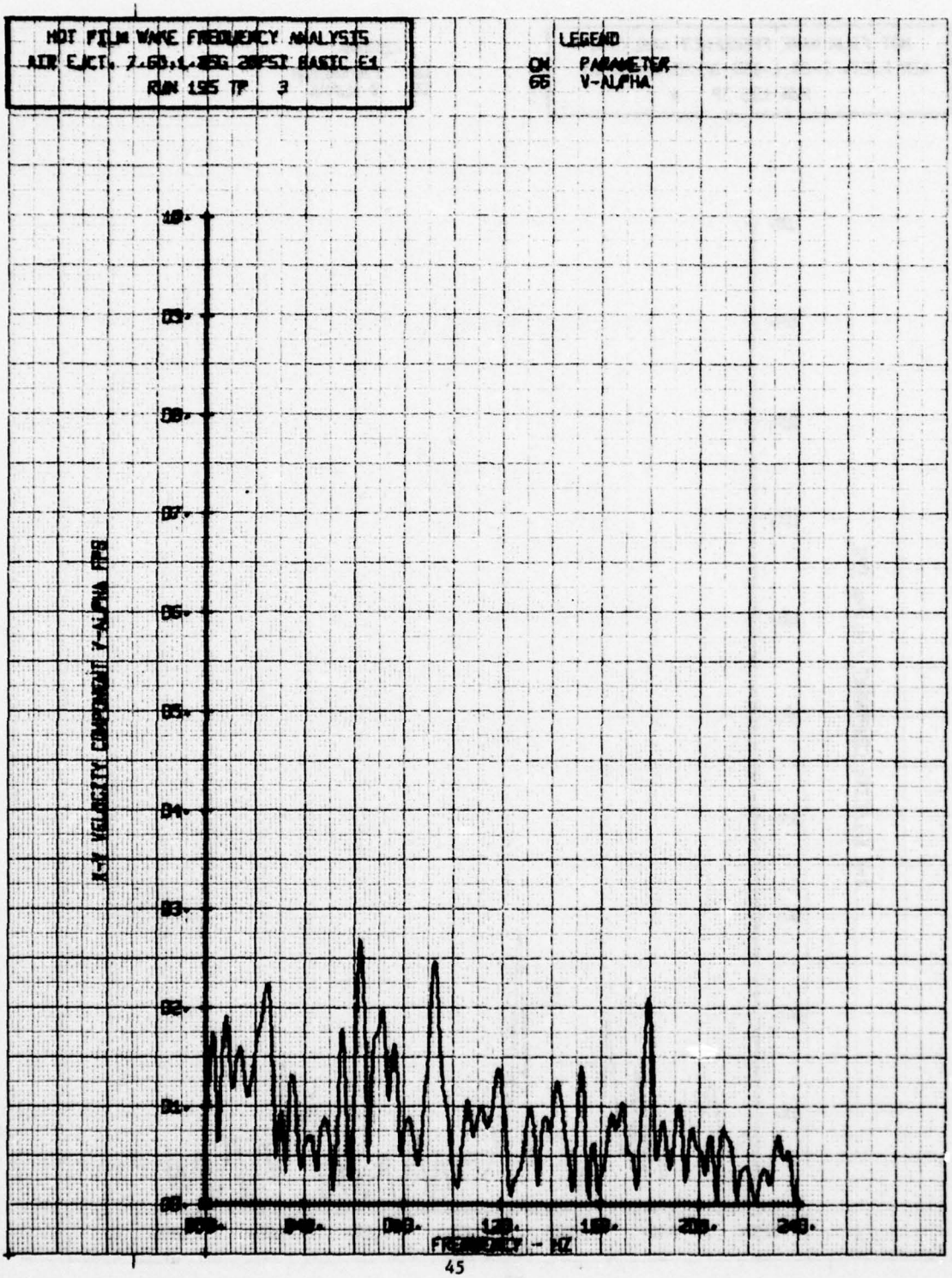
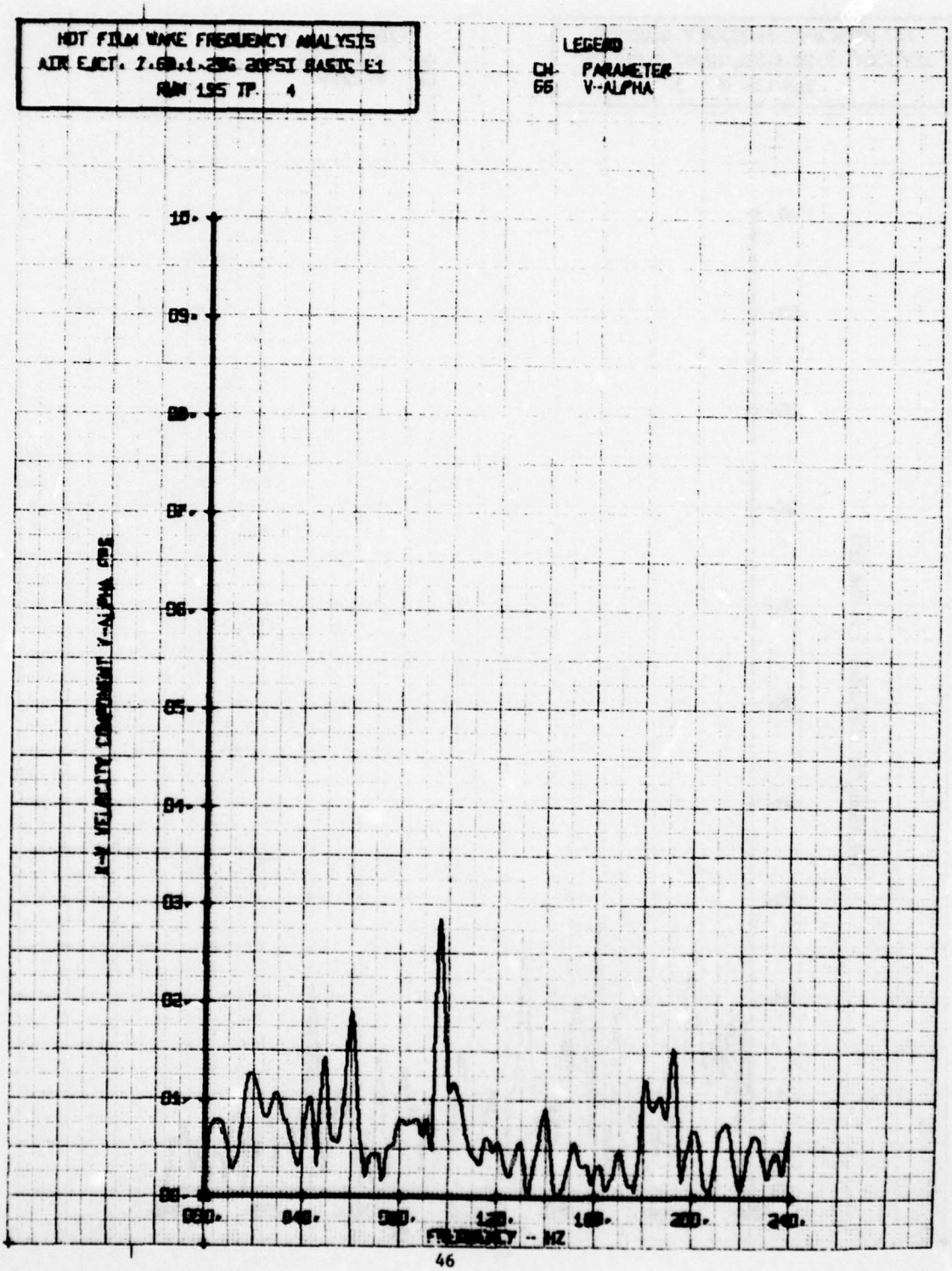
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60.1.25G 20PSI BASIC E1
RUN 195 TP 3
LEGEND
ON PARAMETER
66 V-ALPHA
U-V VELOCITY COMPONENT V-ALPHA RMS
FREQUENCY - KZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 1.60.1.286 20PSI BASIC E1
RUN 195 TP 4
LEGEND
CH PARAMETER
66 V--ALPHA
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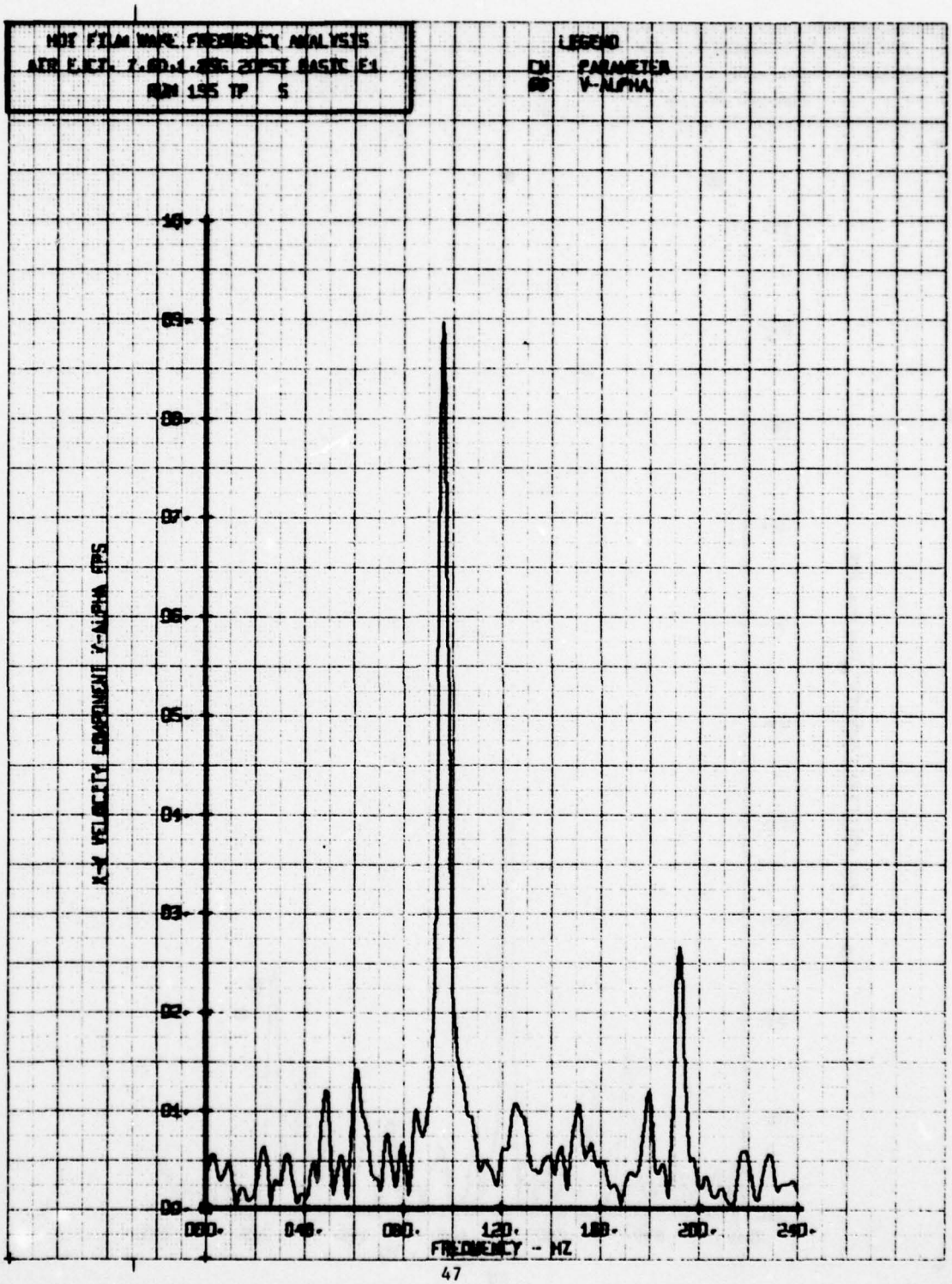
HOT FILM WAKE FREQUENCY ANALYSIS
AIR E.W.C. 7.6D.1.88G.20PSI BASIC E1
RUN 155 TP 5
LEGEND
CH PARAMETER
00 V-ALPHA
K-V VELOCITY COMPONENT V-ALPHA FPS
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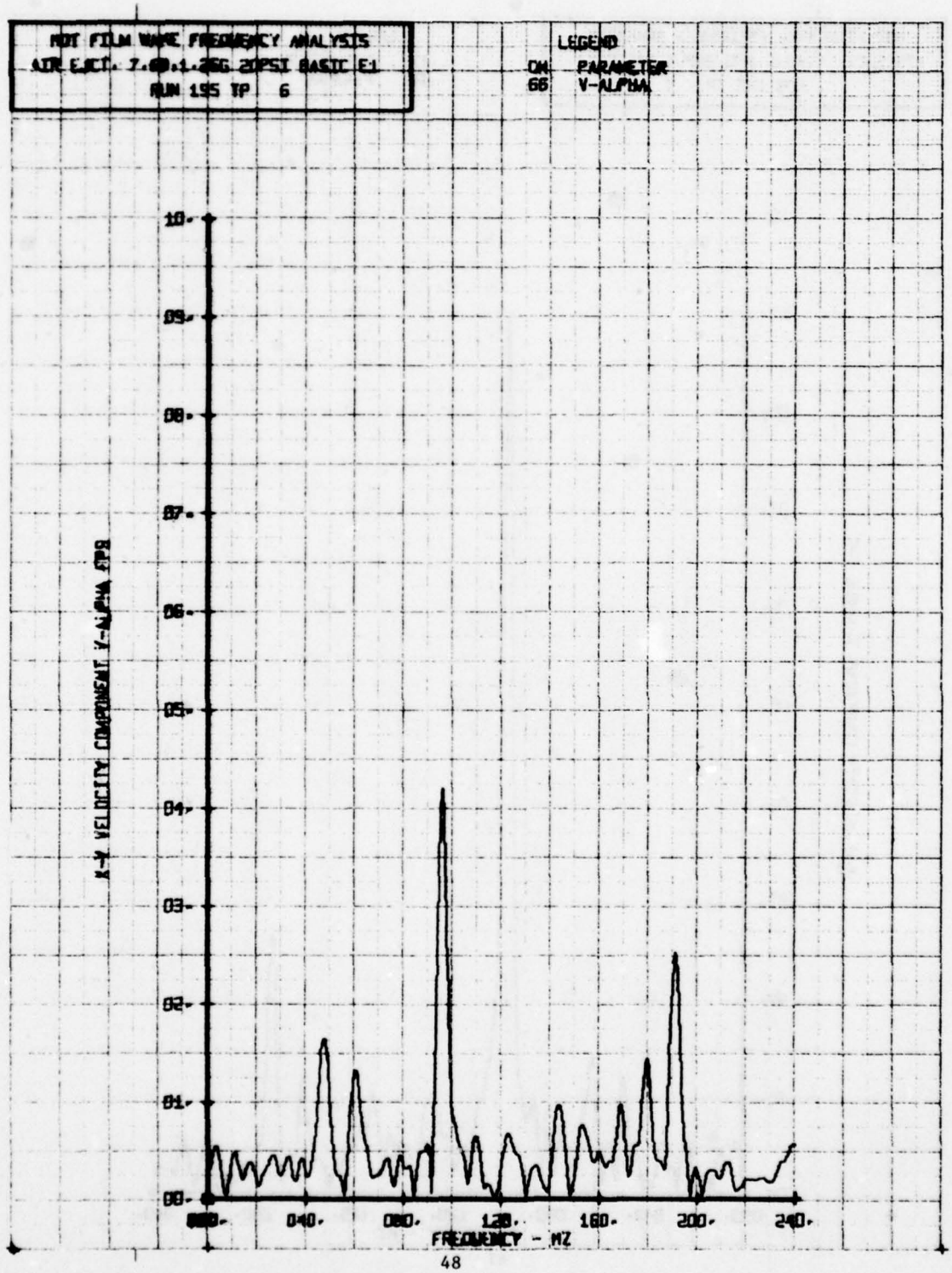
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.0@1.25G 20PSI BASIC E1
RUN 195 TP 6
LEGEND
ON PARAMETER
66 V-ALPHA
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X-V VELOCITY COMPONENT V-ALPHA FPS
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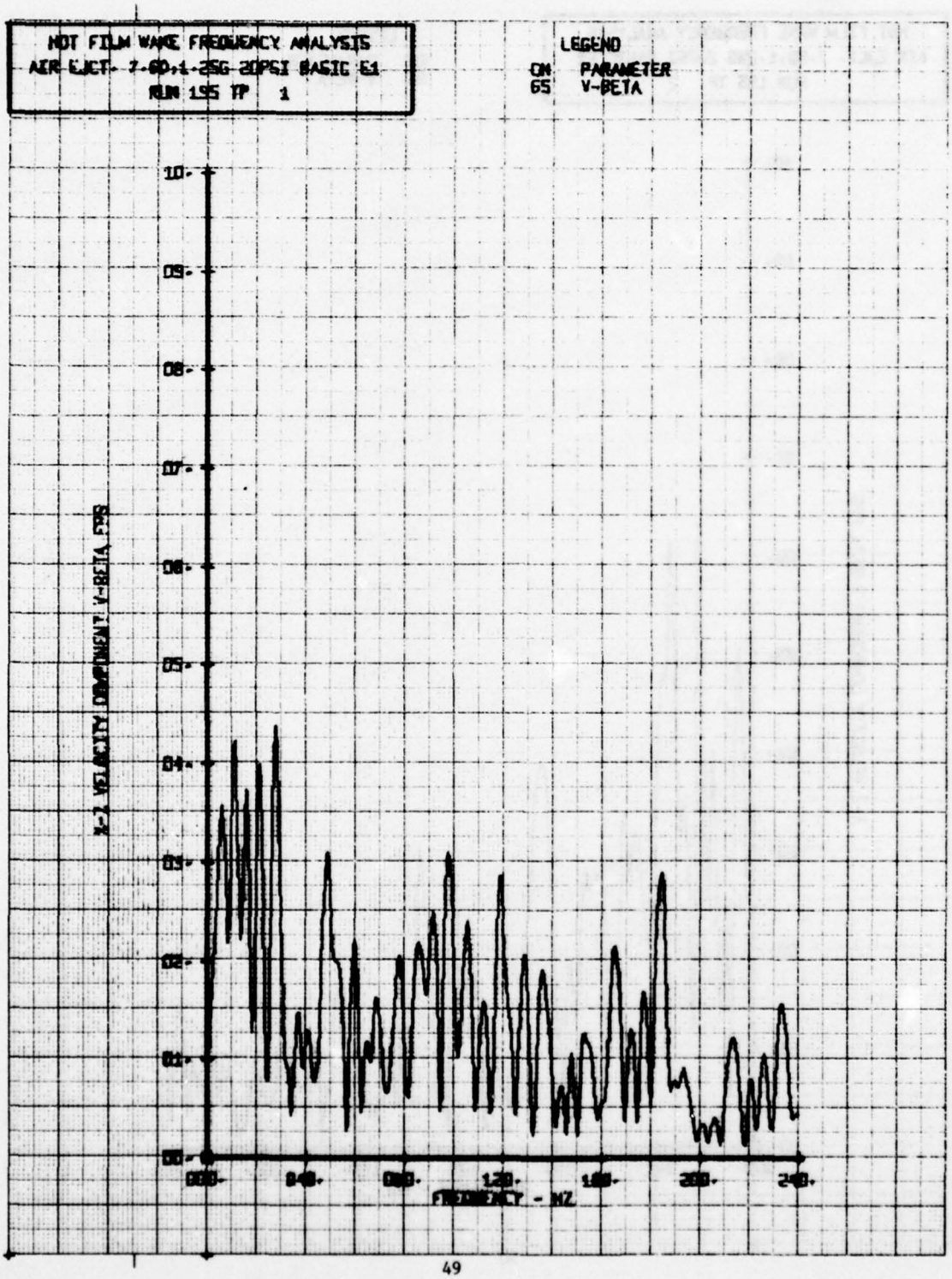
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AER EJCT- 7-60,1-25G-20PSI BASIC E1
RUN 155 TP 1
LEGEND
CH PARAMETER
65 V-BETA
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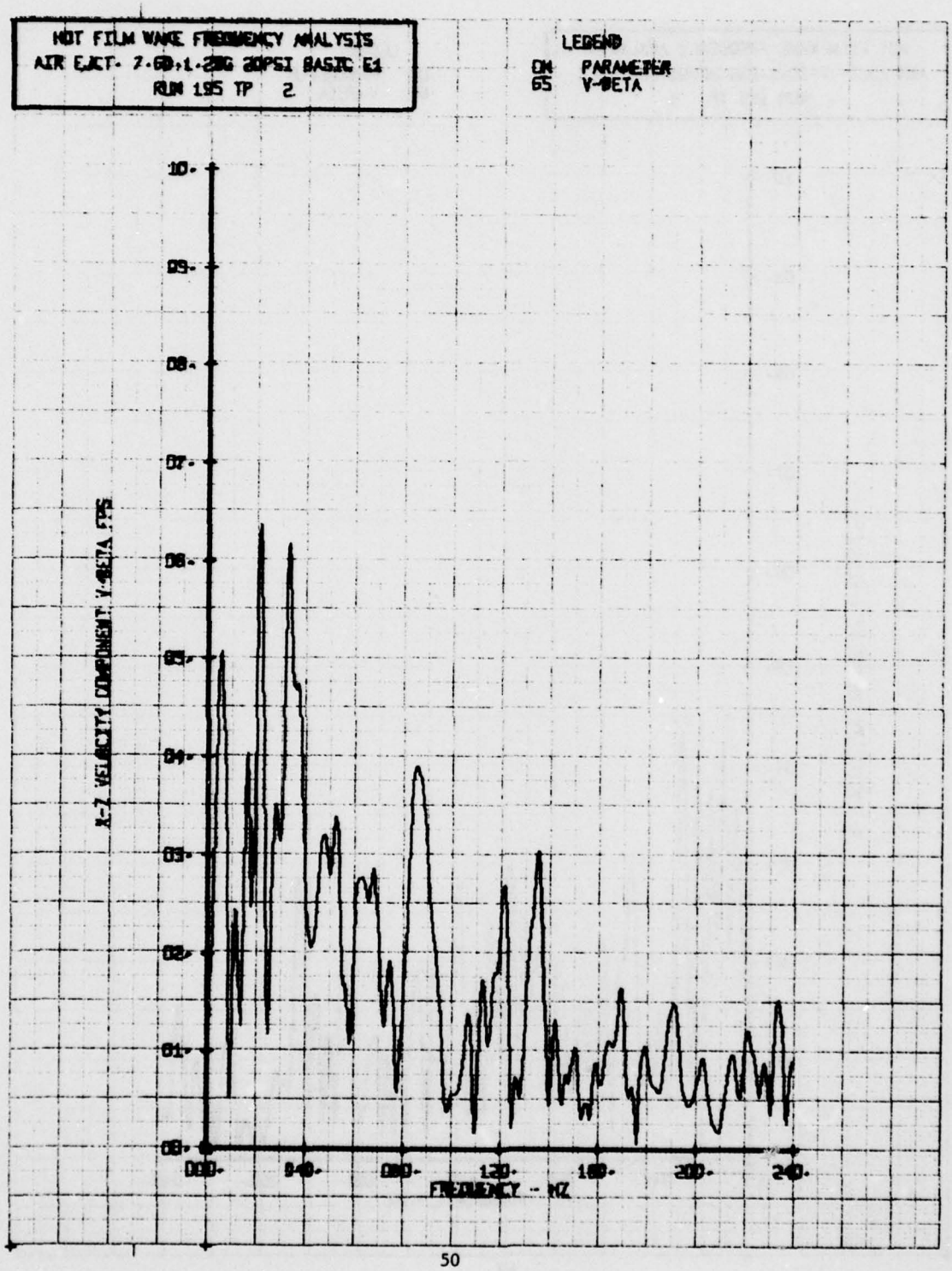
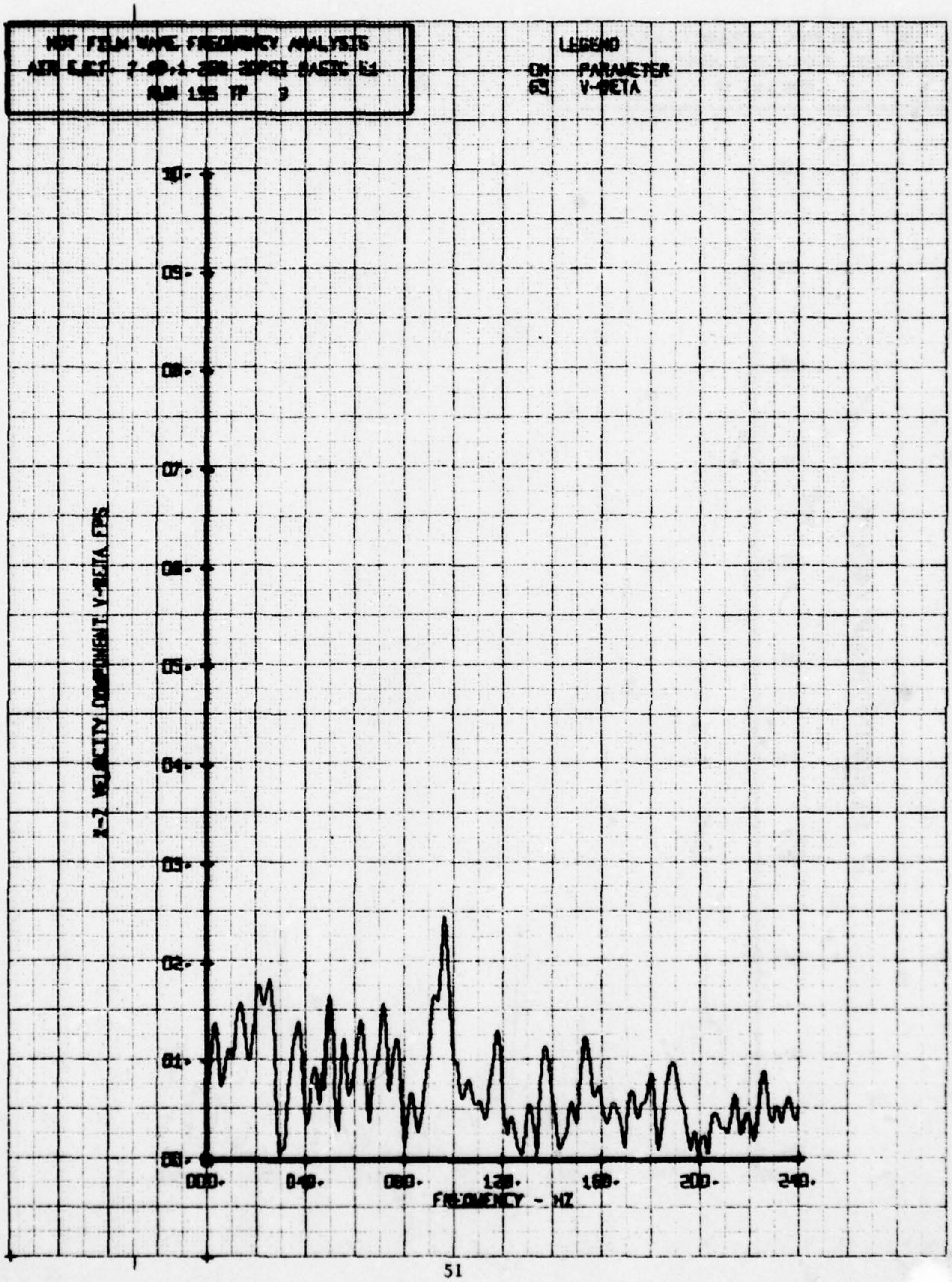
FREQUENCY - HZ
SQS V-BETA AUTOMATIC COMPONENT


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 2.60,1.20G 20PSI BASIC E1
RUN 195 TP 2
LEGEND
ON PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FPS
FREQUENCY - HZ


HOT FILM WAVE FREQUENCY ANALYSIS
LEGEND
CH PARAMETER
63 V-BETA
10
09
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080
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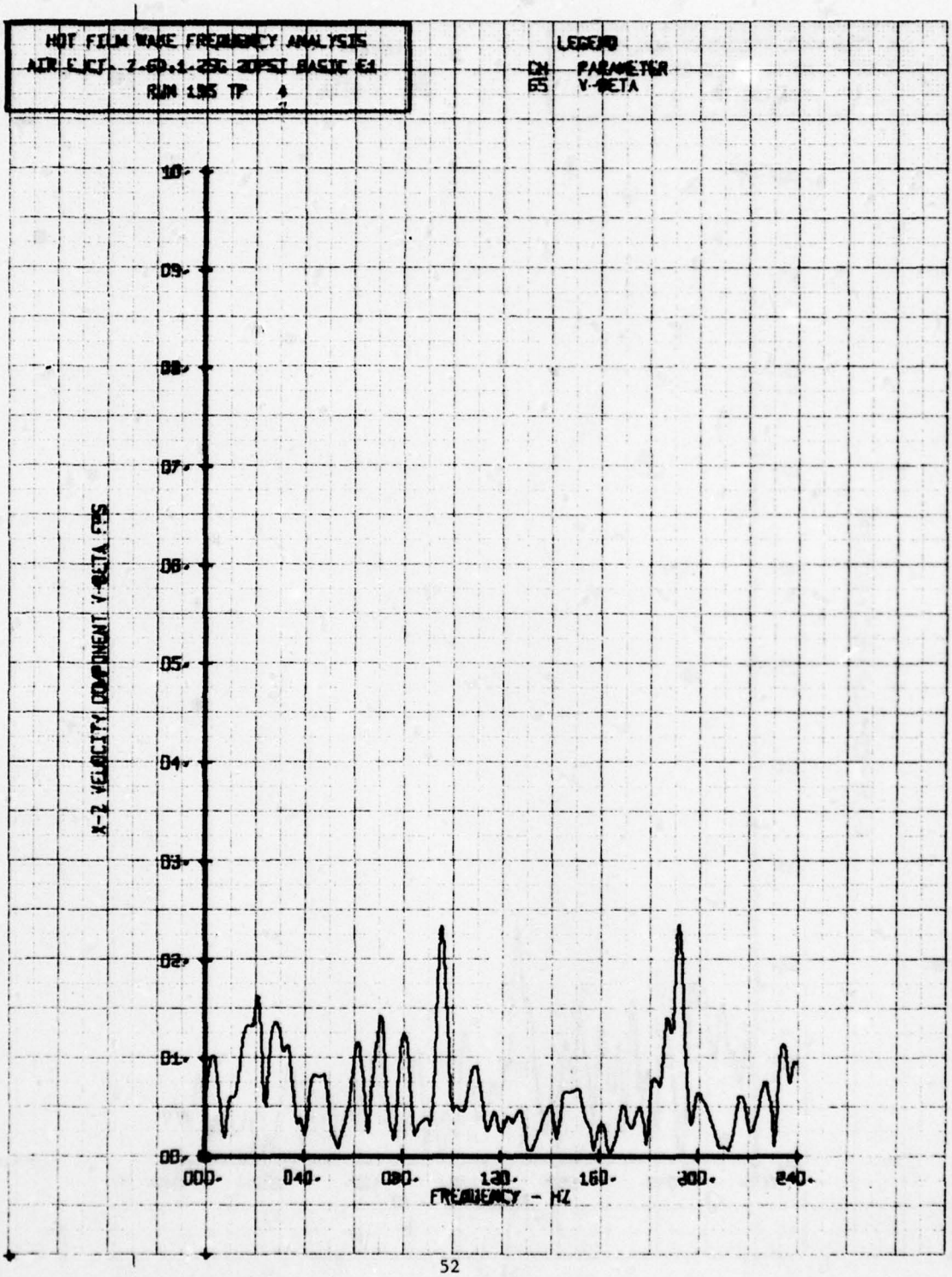
160
200
240
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 2-60.1-25G 20PSI BASIC E1
RUN 195 TP 4
LEGEND
CH PARAMETER
65 V-BETA
10.
09.
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X-2 VELOCITY COMPONENT V-BETA EMS
000.
040.
080.
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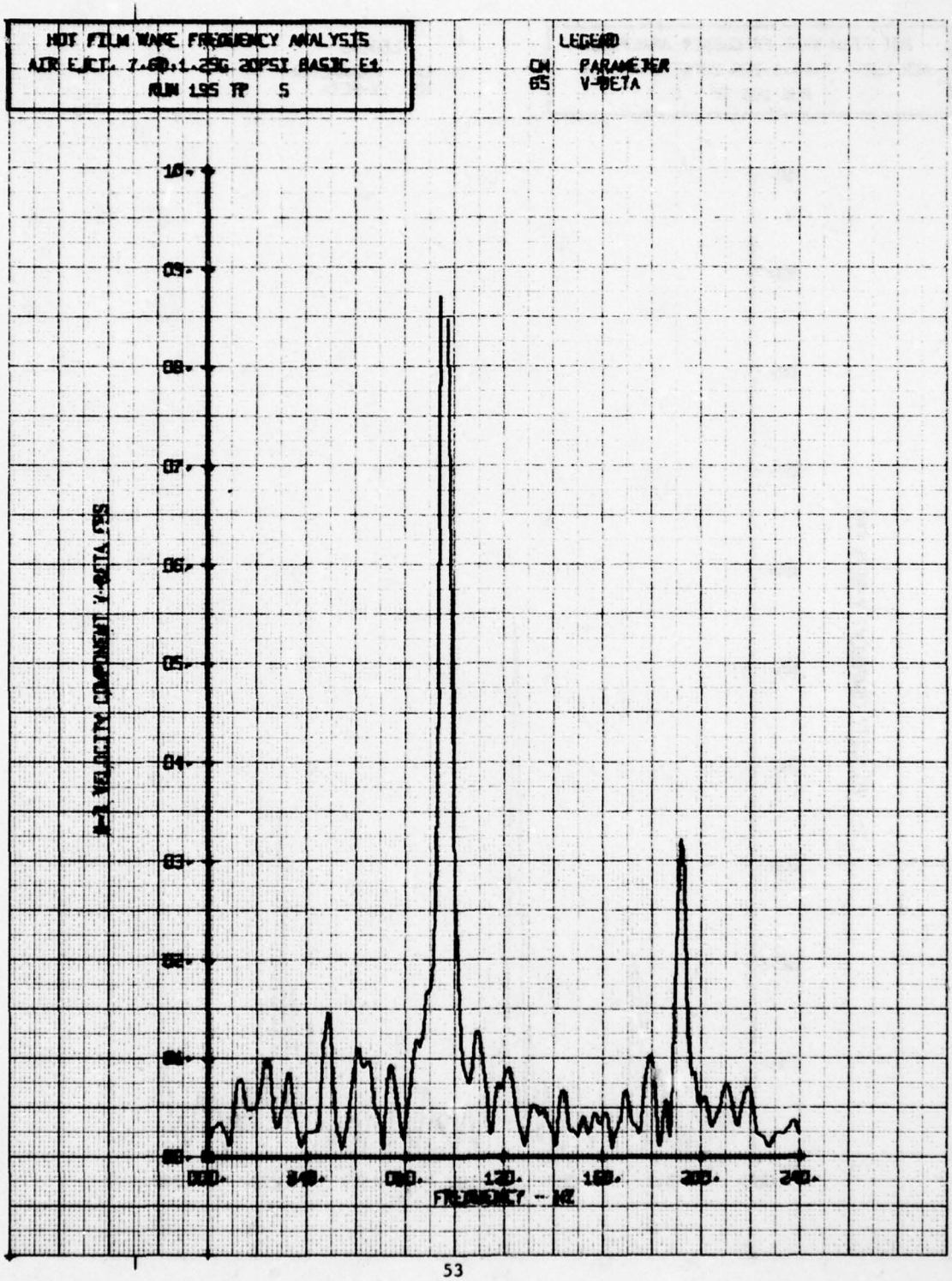
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60.1.256 20PSI BASIC E1
RUN 195 TP 5
LEGEND
CH PARAMETER
65 V-BETA
10.
09.
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040.
080.
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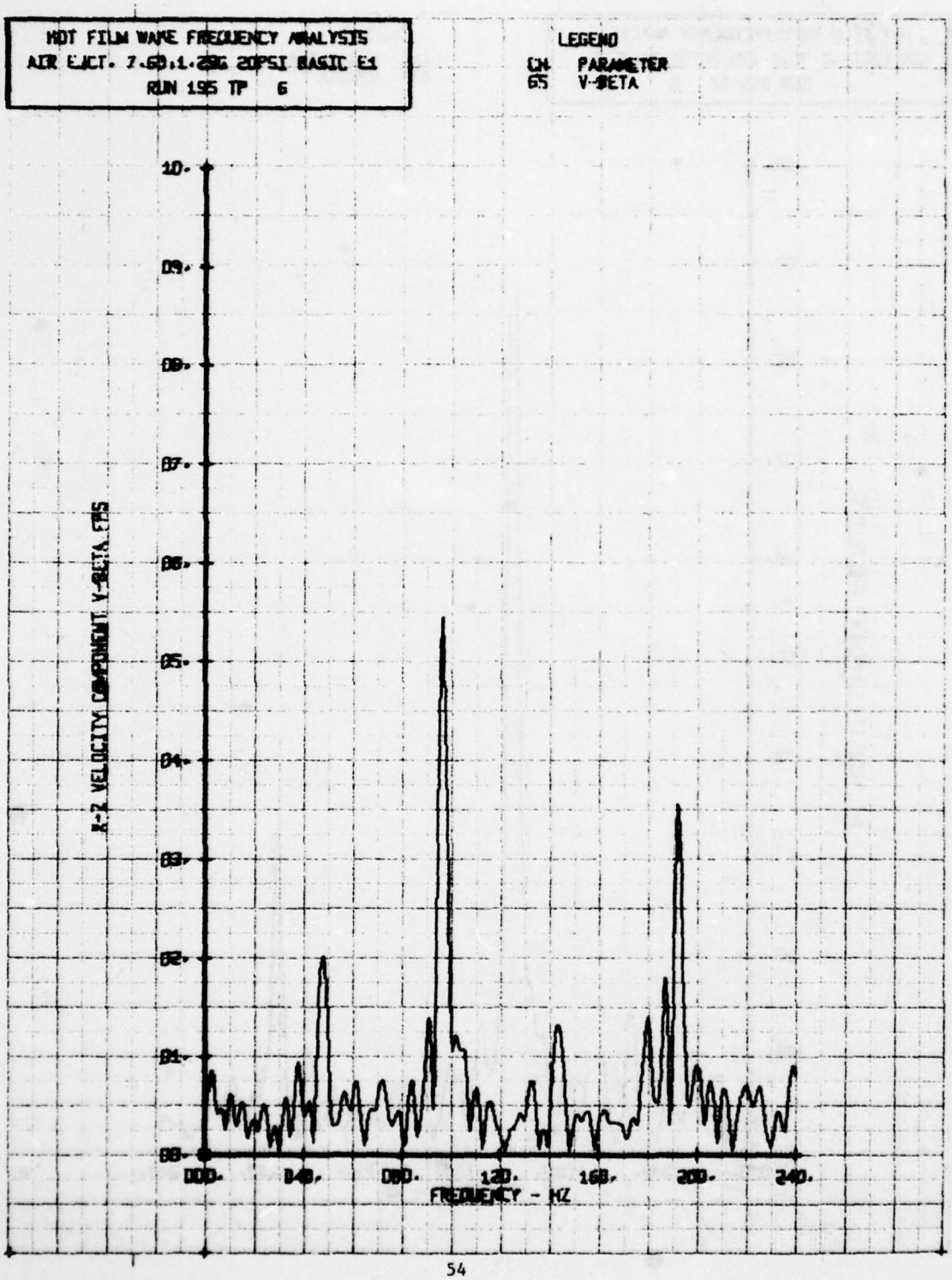
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.286 20PSI BASIC E1
RUN 195 TP 6
LEGEND
CH PARAMETER
65 V-BETA
10.
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X-2 VELOCITY COMPONENT V-BETA FPS
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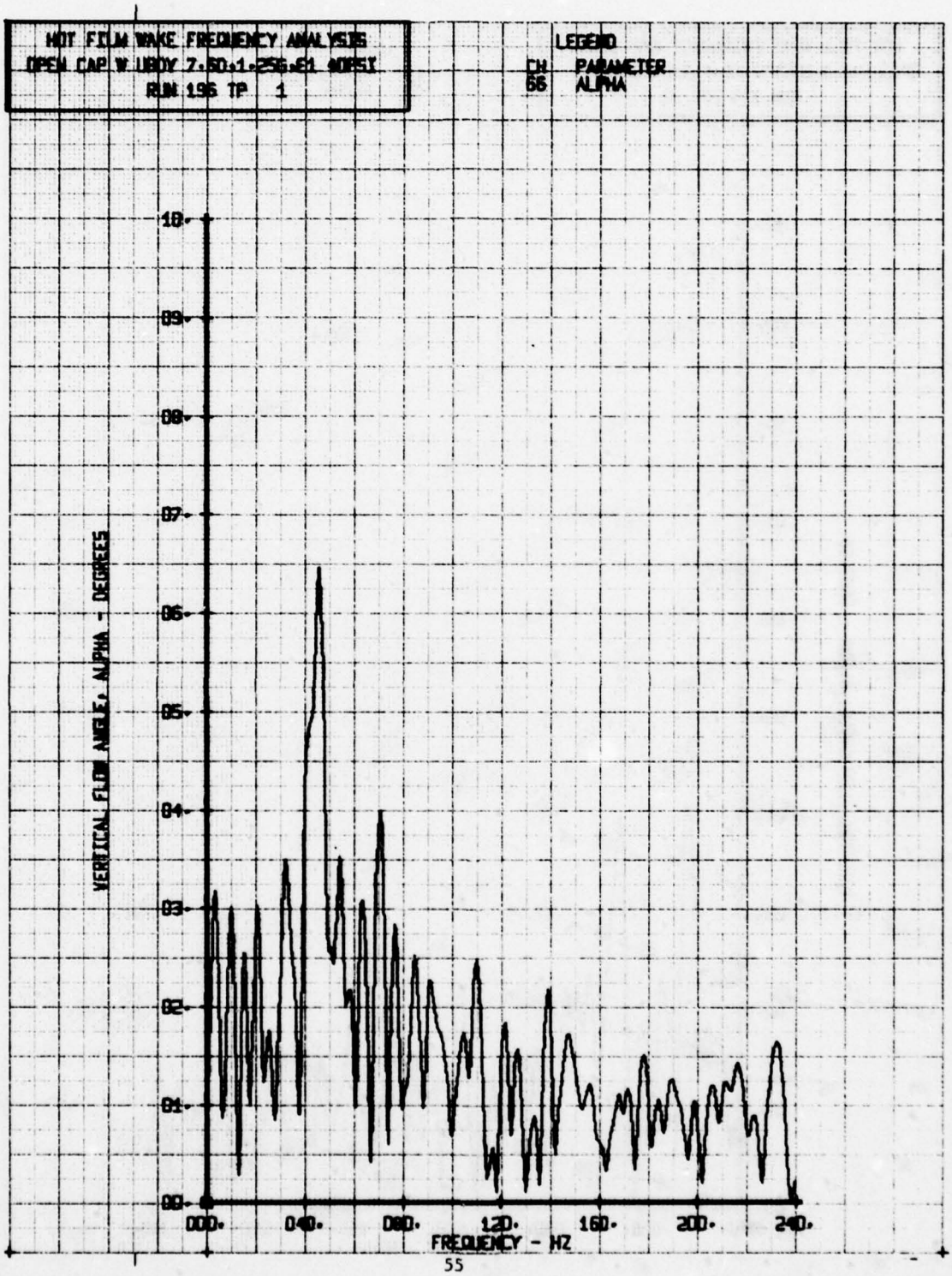
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W BODY 7.50:1.256.E1 40PSI
RUN 196 TP 1
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
10.
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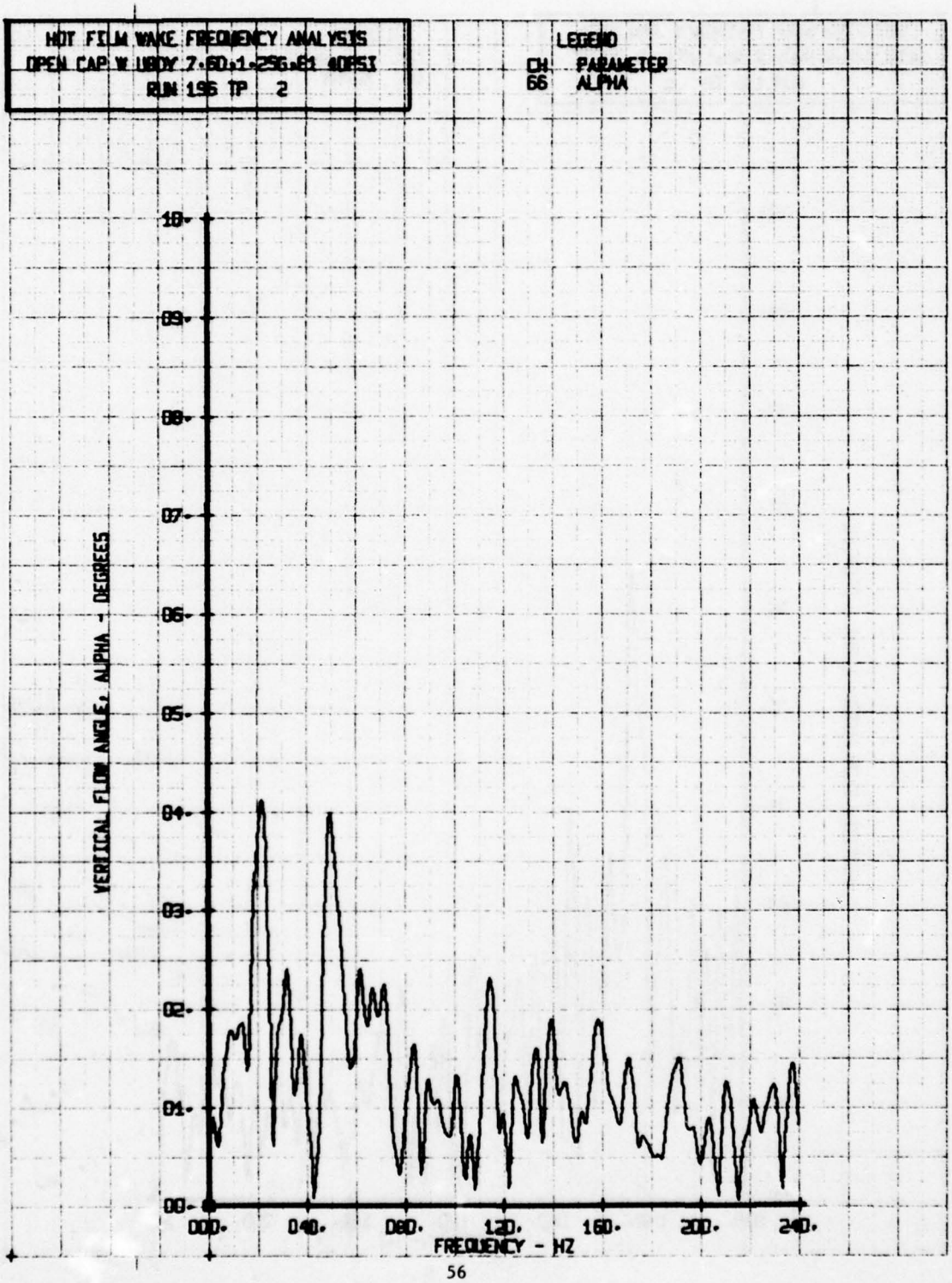
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W BODY 7-60-1-256-81 40PSI
RUN 196 TP 2
LEGEND
CH PARAMETER
66 ALPHA
10.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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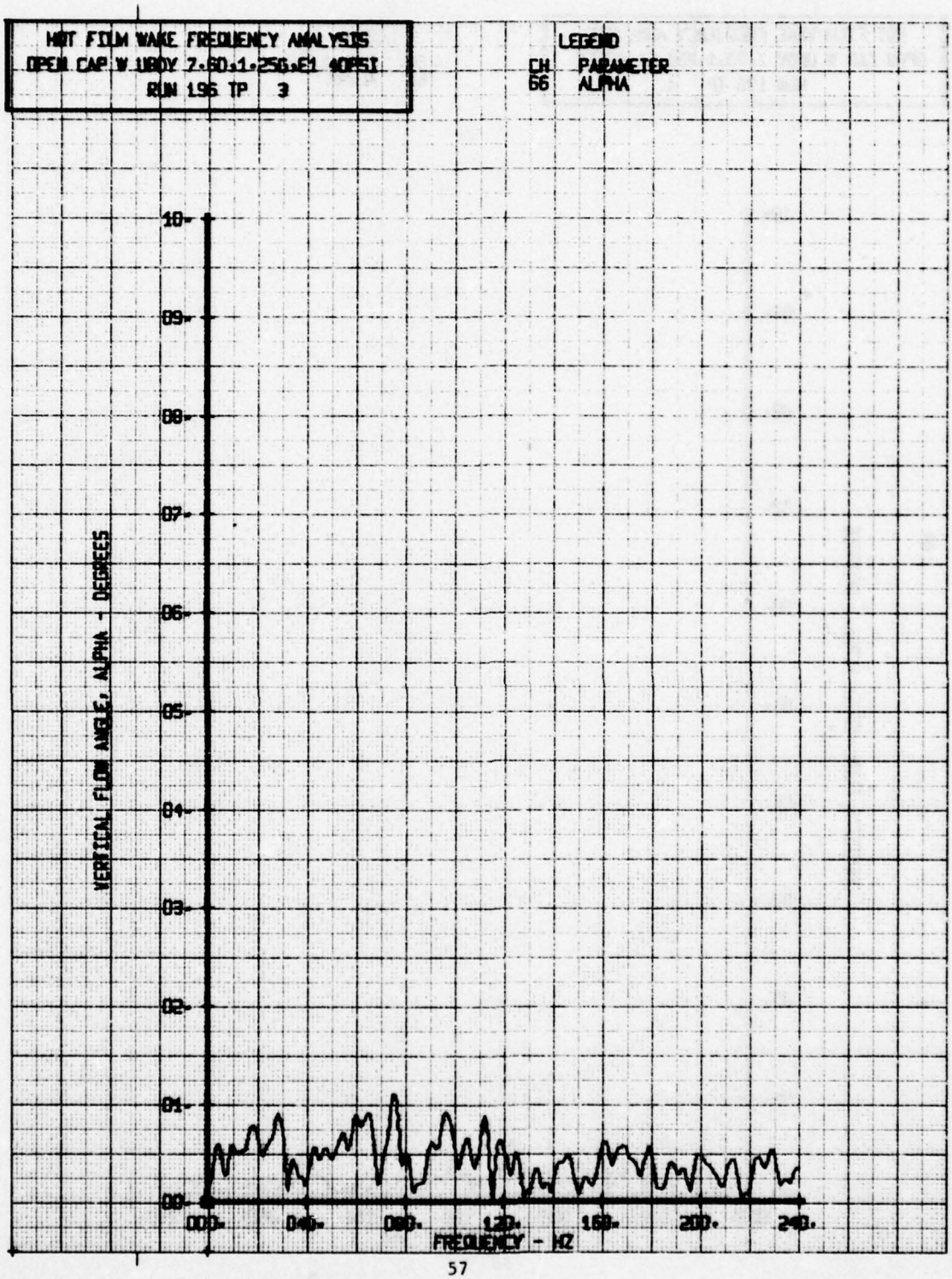
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W 1BODY 7.60s1.25Gs01 40PSI
RUN 196 TP 3
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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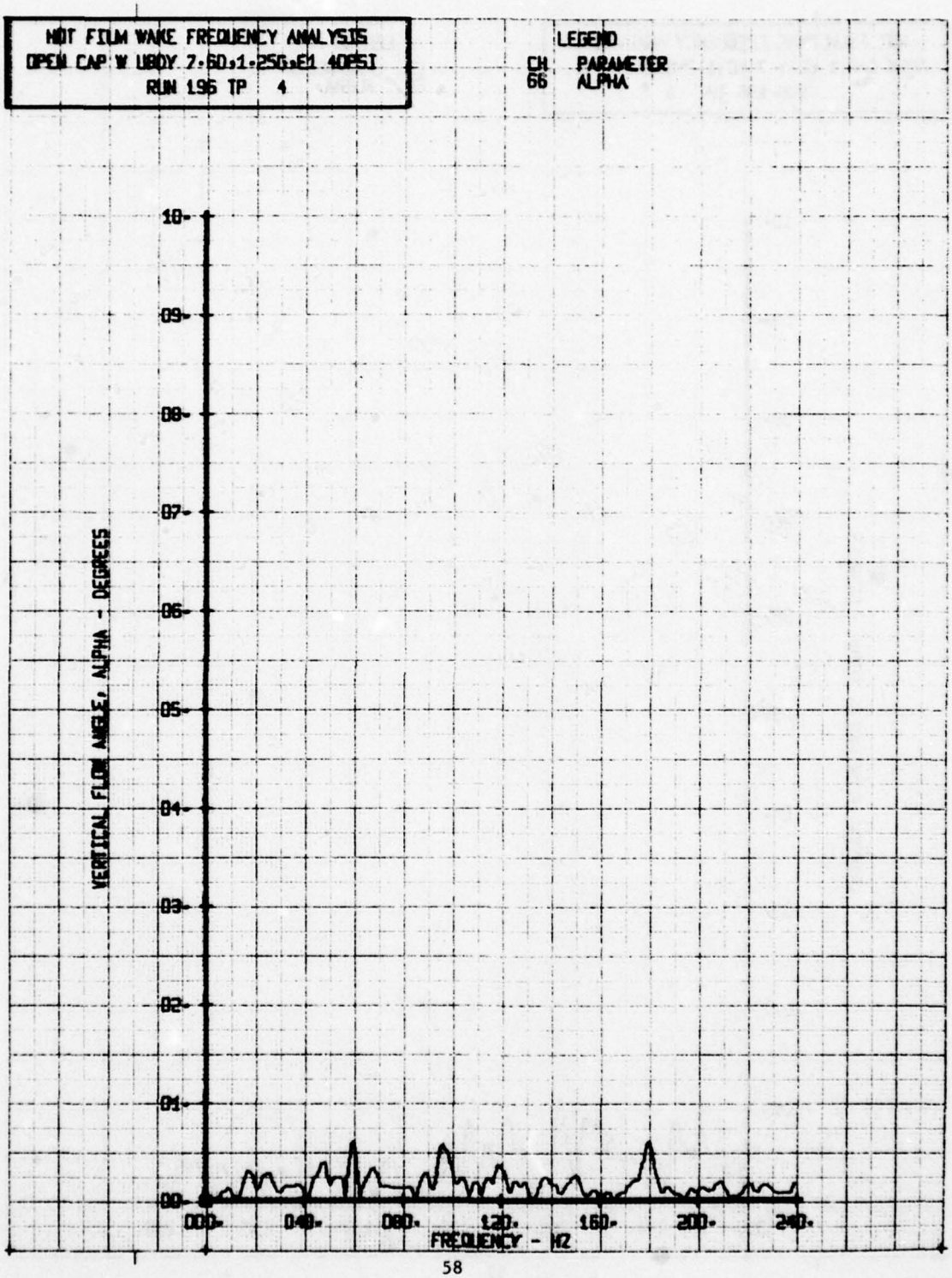
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60,1.25G,E1 40PSI
RUN 196 TP 4
LEGEND
CH PARAMETER
66 ALPHA
10-
09-
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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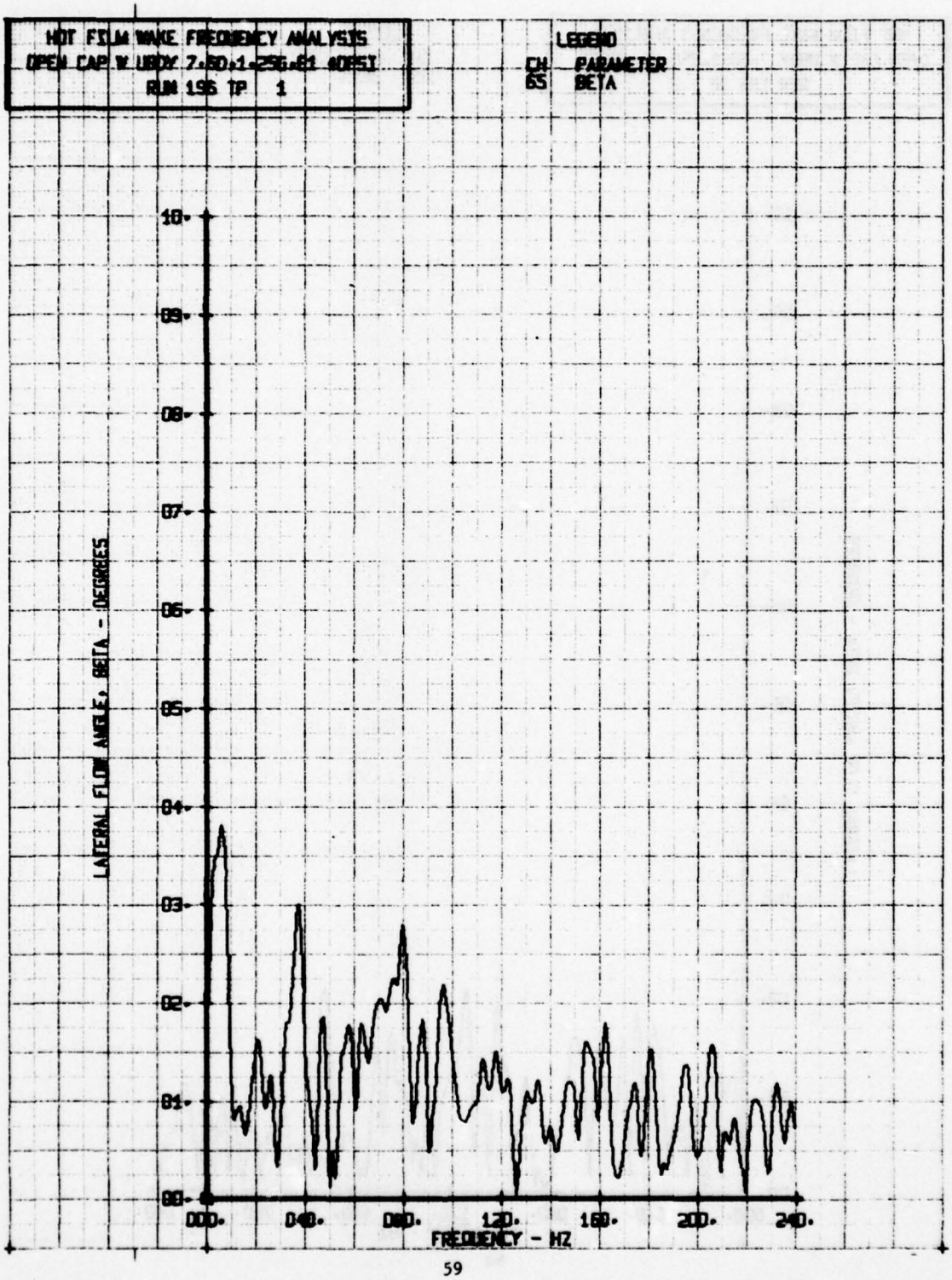
040-
080-
120-
160-
200-
240-
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.50,1.256,61 40FST
RUN 195 TP 1
LEGEND
CH PARAMETER
65 BETA
10.
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LATERAL FLOW ANGLE, BETA - DEGREES
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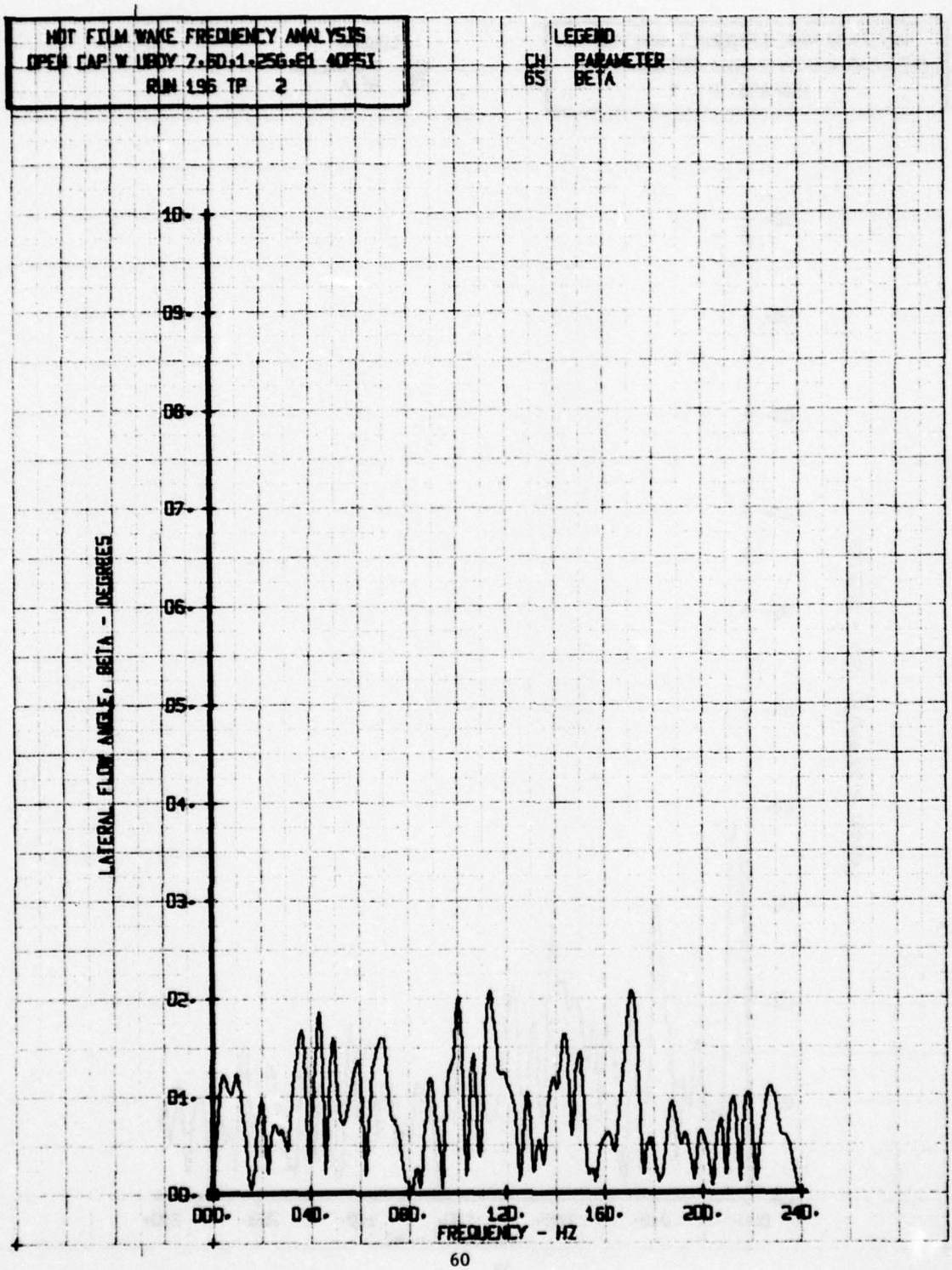
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.50,1.256,61 40PSI
RUN 196 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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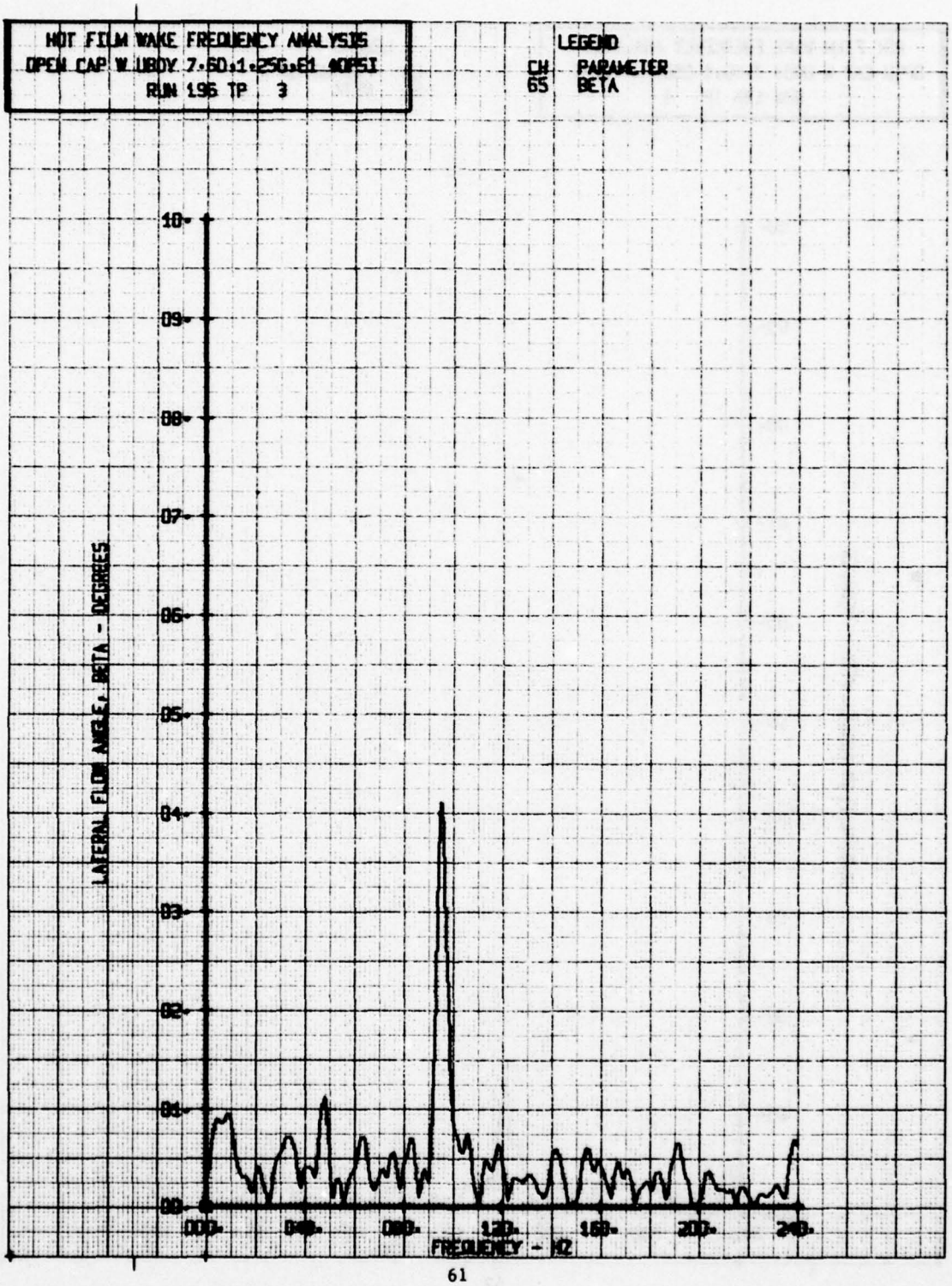
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W.UBDY 7.5D.1.25G.E1 40PSI
RUN 196 TP 3
LEGEND
CH PARAMETER
65 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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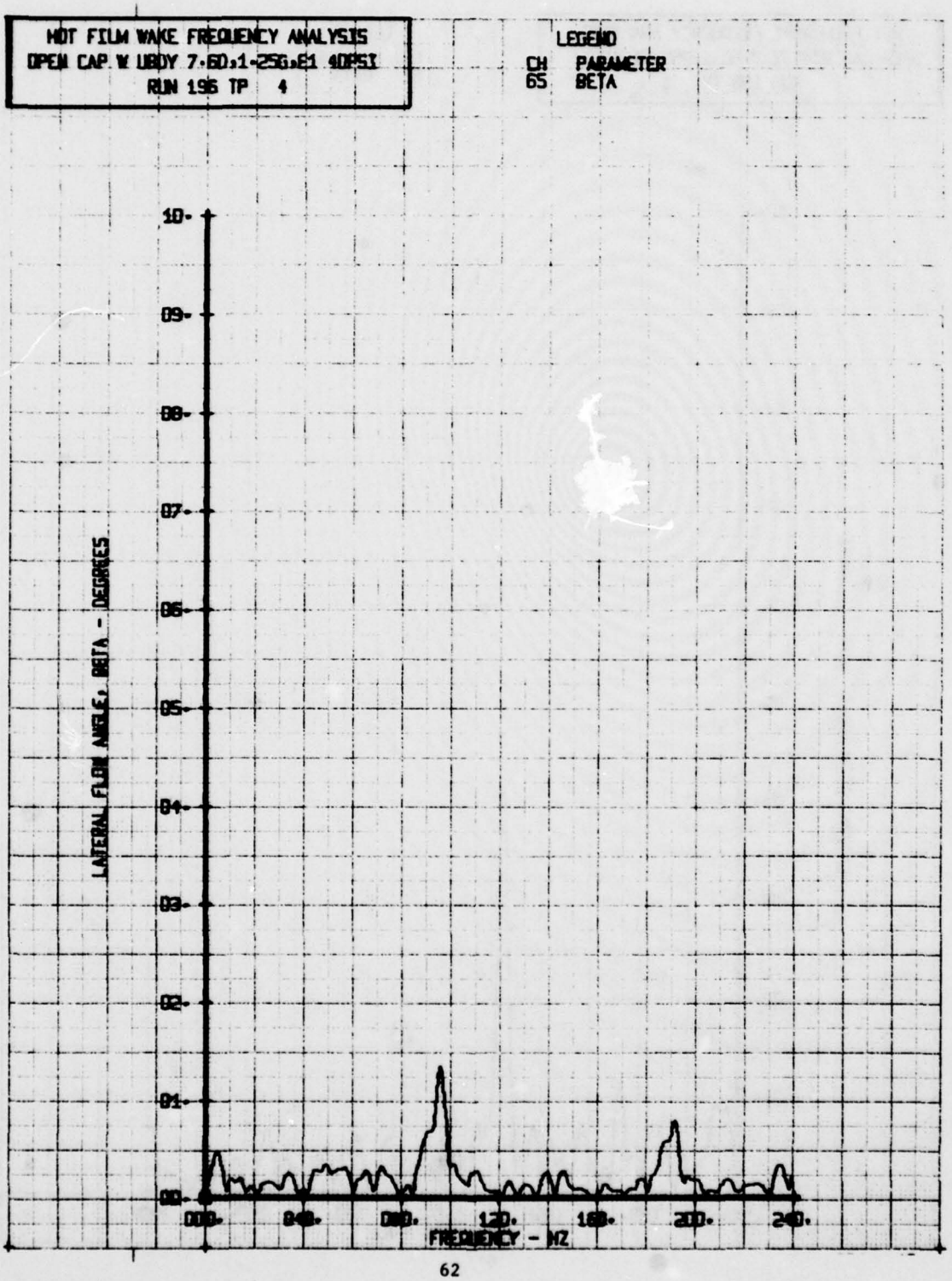
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60,1.25G,61 40PSI
RUN 196 TP 4
LEGEND
CH PARAMETER
65 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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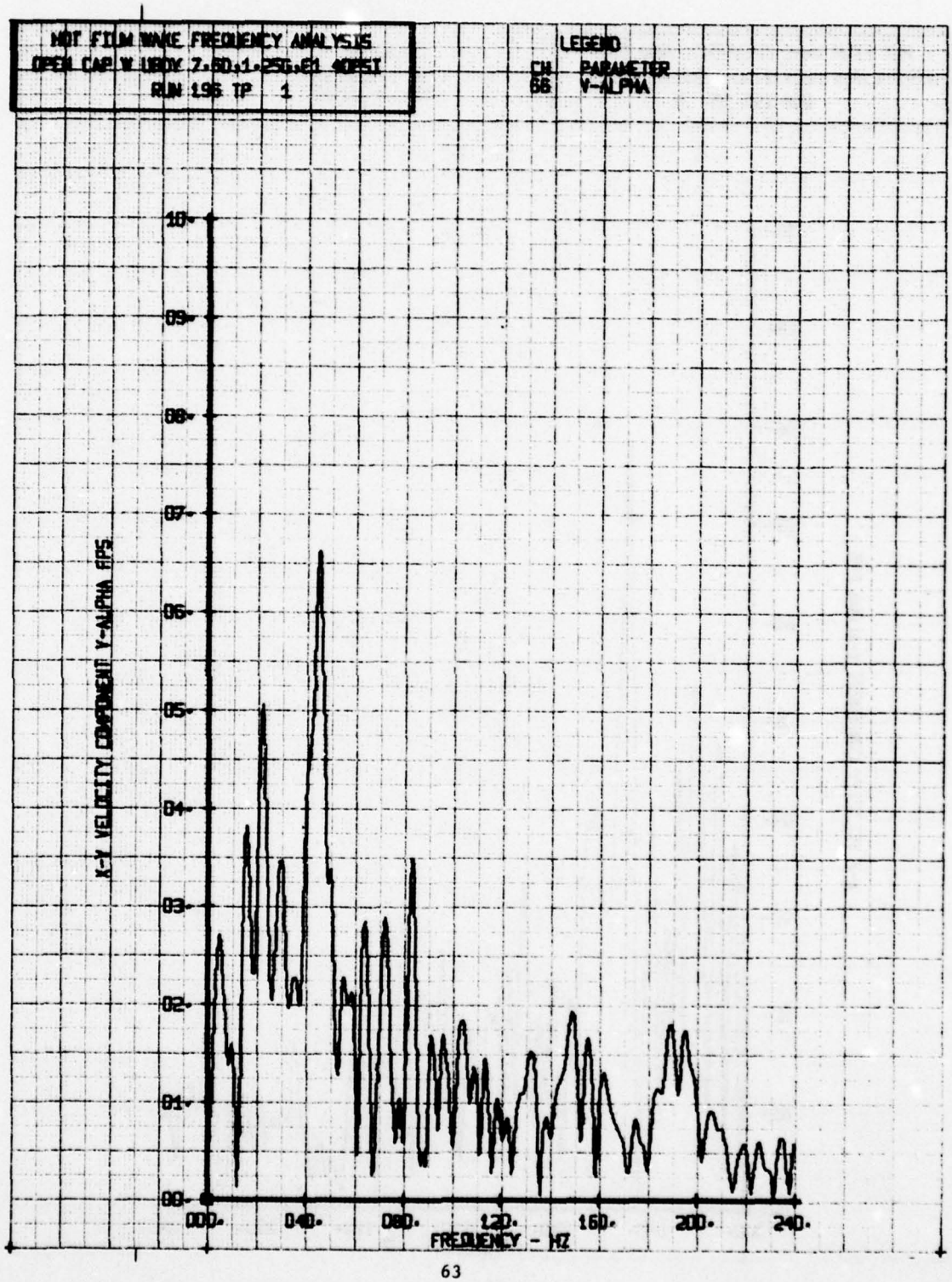
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 2.50,1.25G,E1 40PSI
RUN 196 TP 1
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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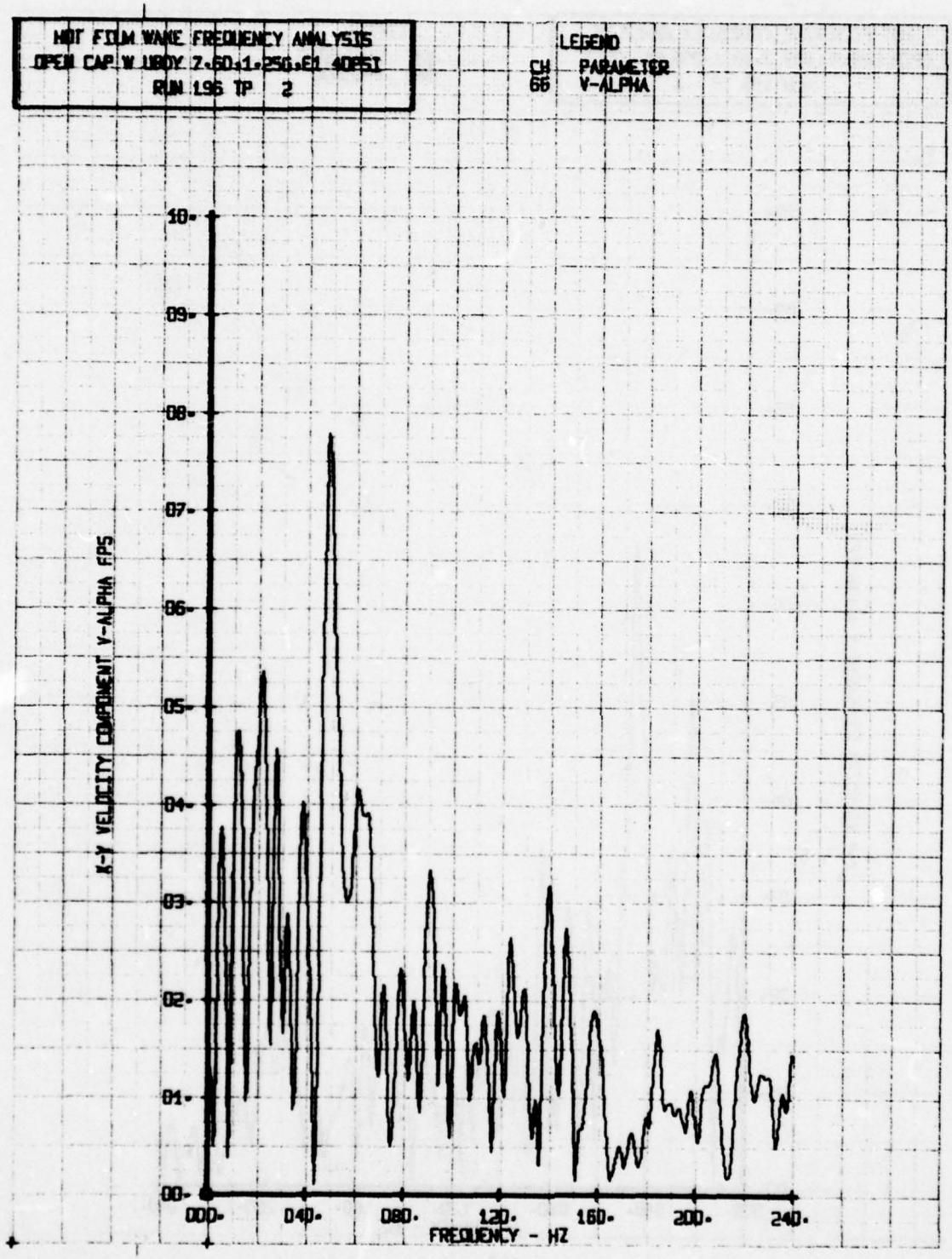
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60,1.250,E1 40PSI
RUN 196 TP 2
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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080-
120-
160-
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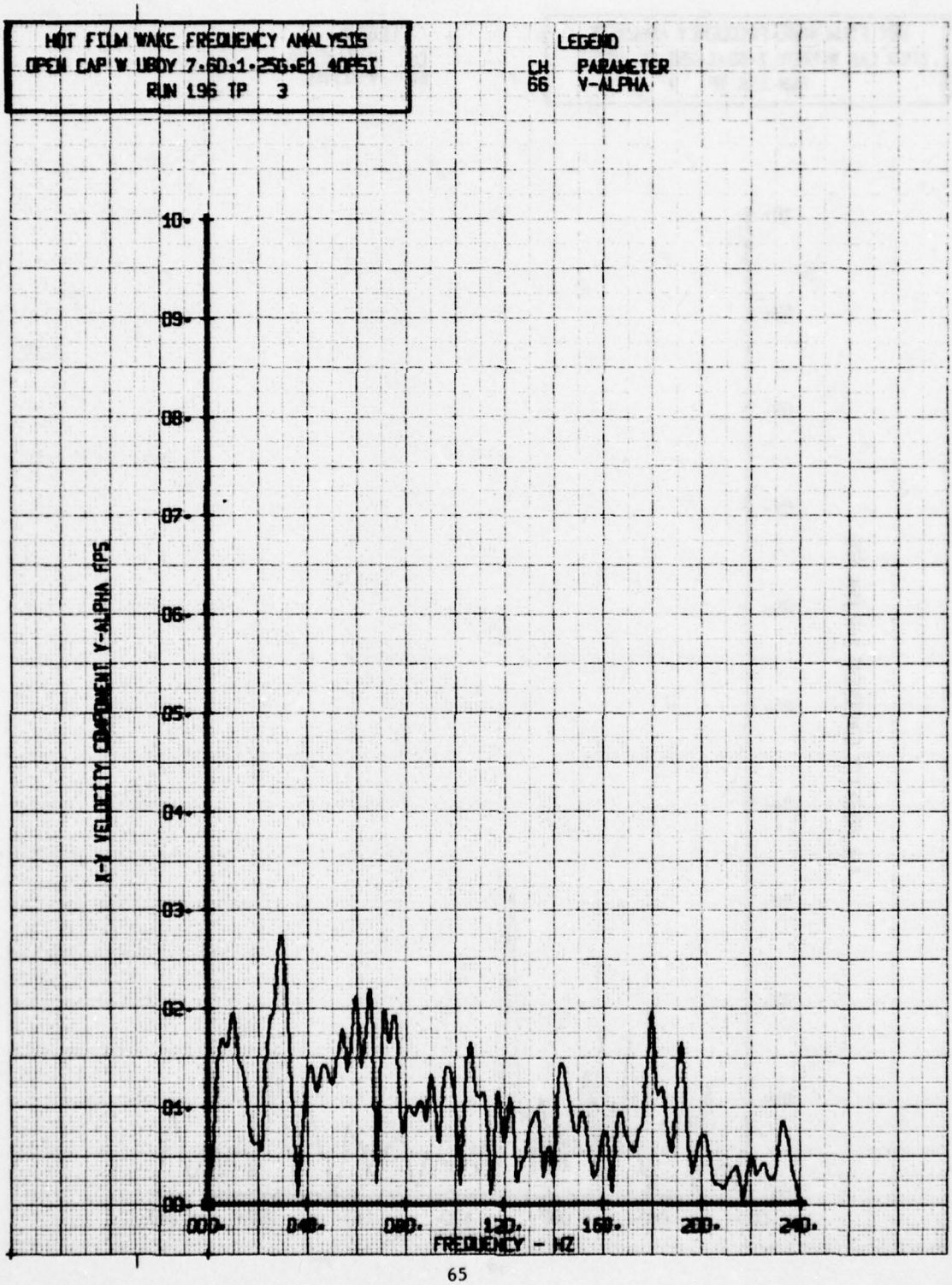
240-
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBOY 7.60.1.250.E1 40PSI
RUN 196 TP 3
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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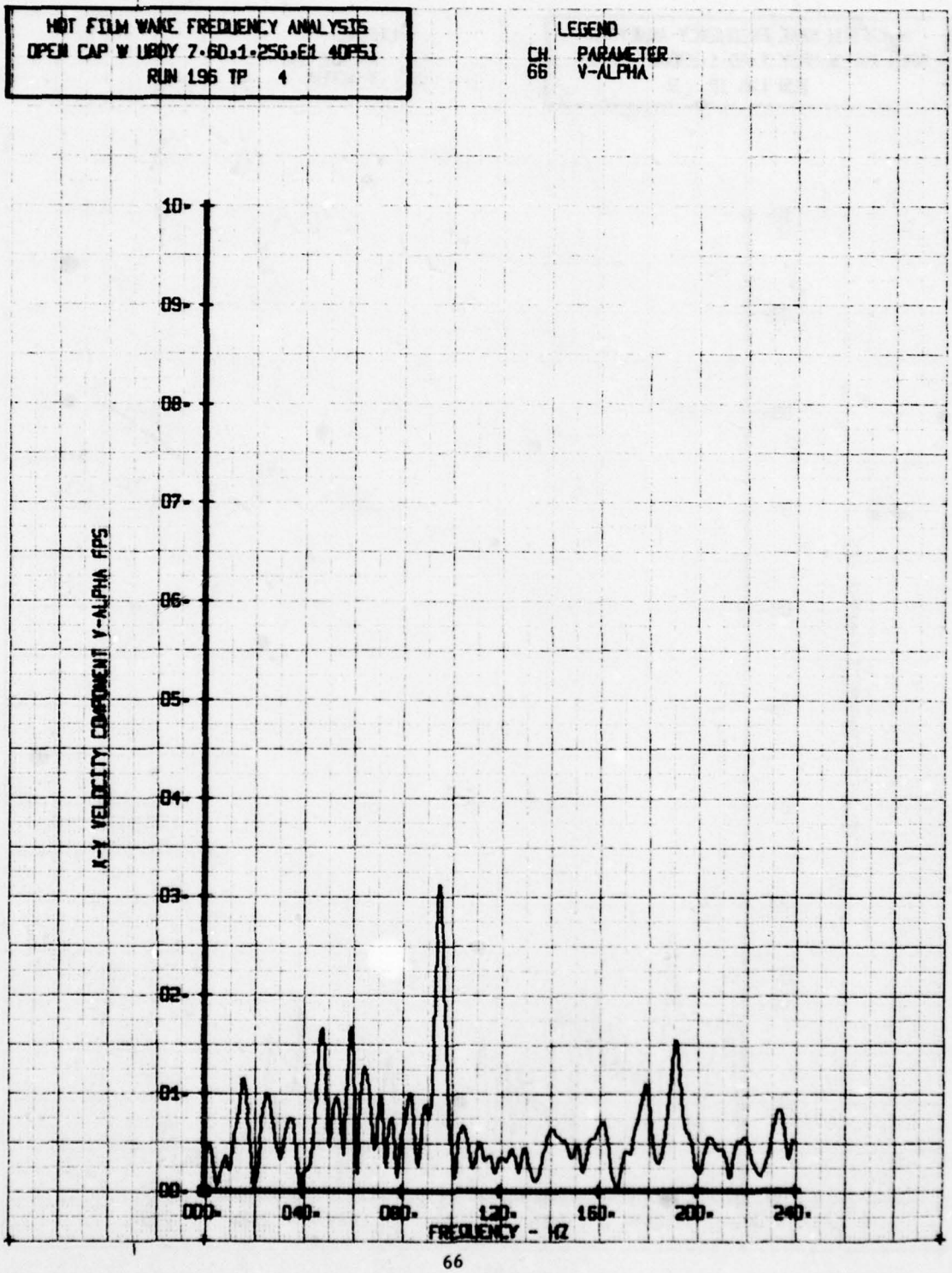
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBOY 7.6D.1.25G.E1 40PSI
RUN 196 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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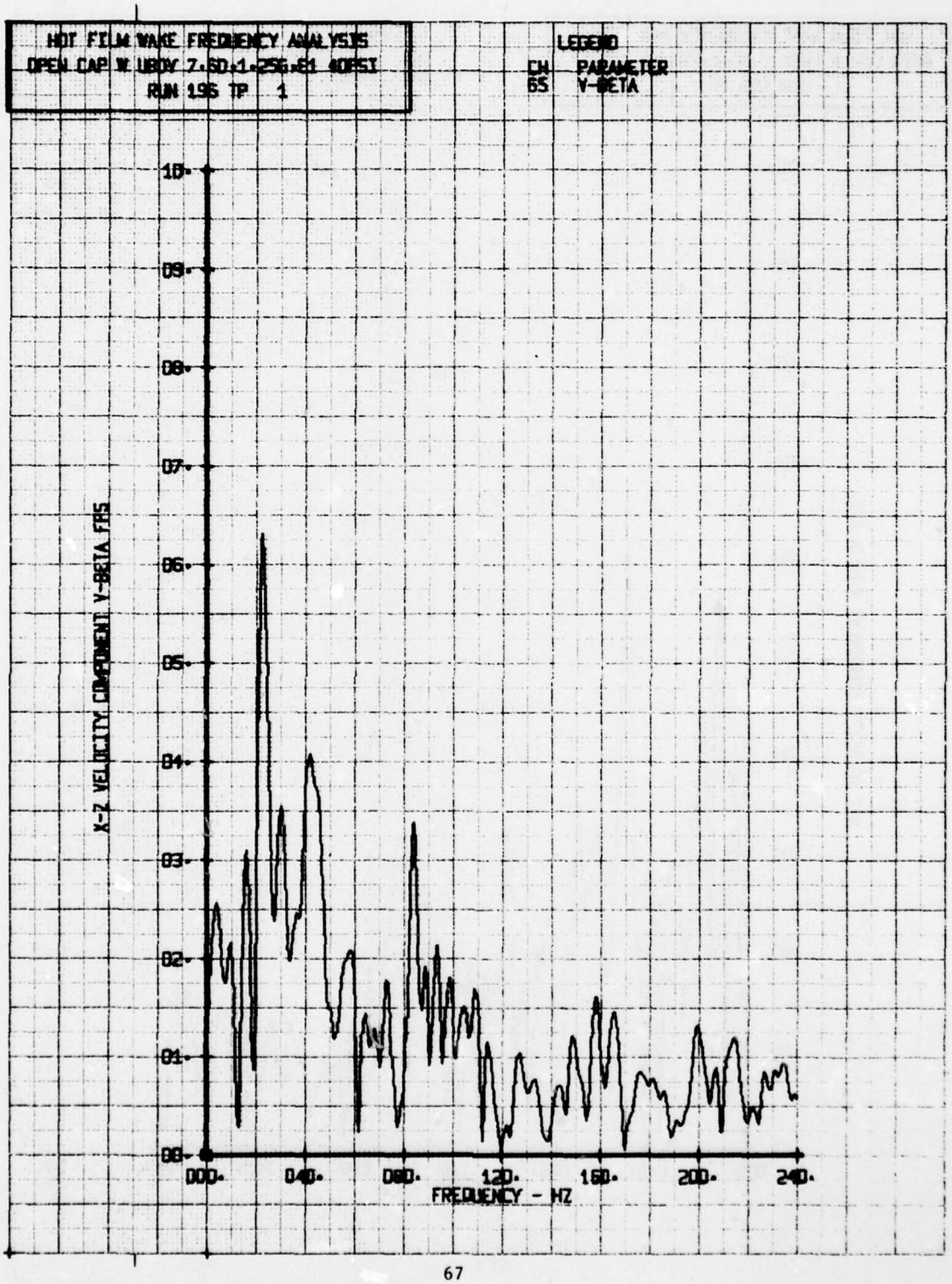
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.5D+1.25G+E1 40KSI
RUN 195 TP 1
LEGEND
CH PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FRS
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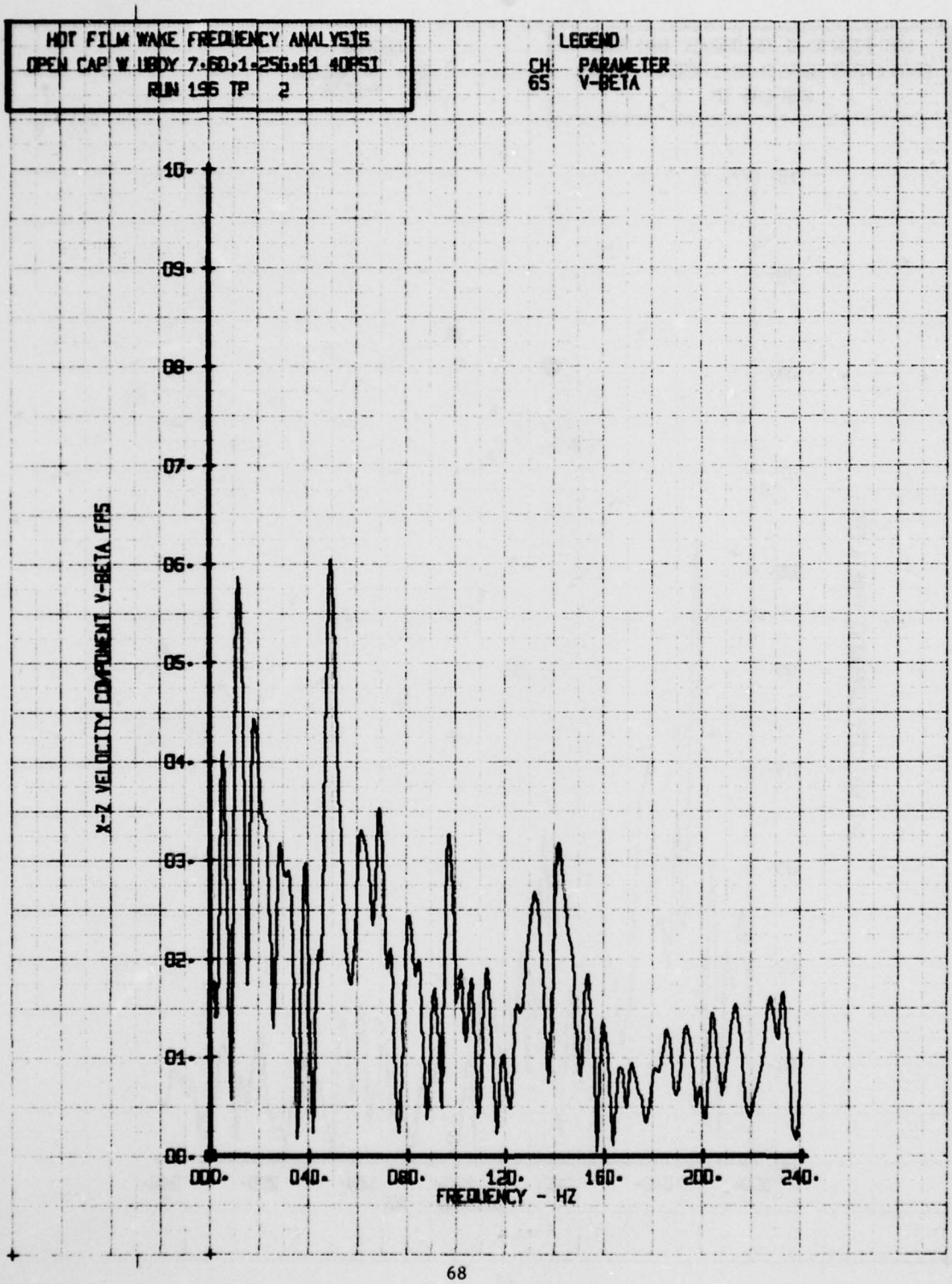
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60.1=25G.61 40PSI
RUN 196 TP 2
LEGEND
CH PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FPS
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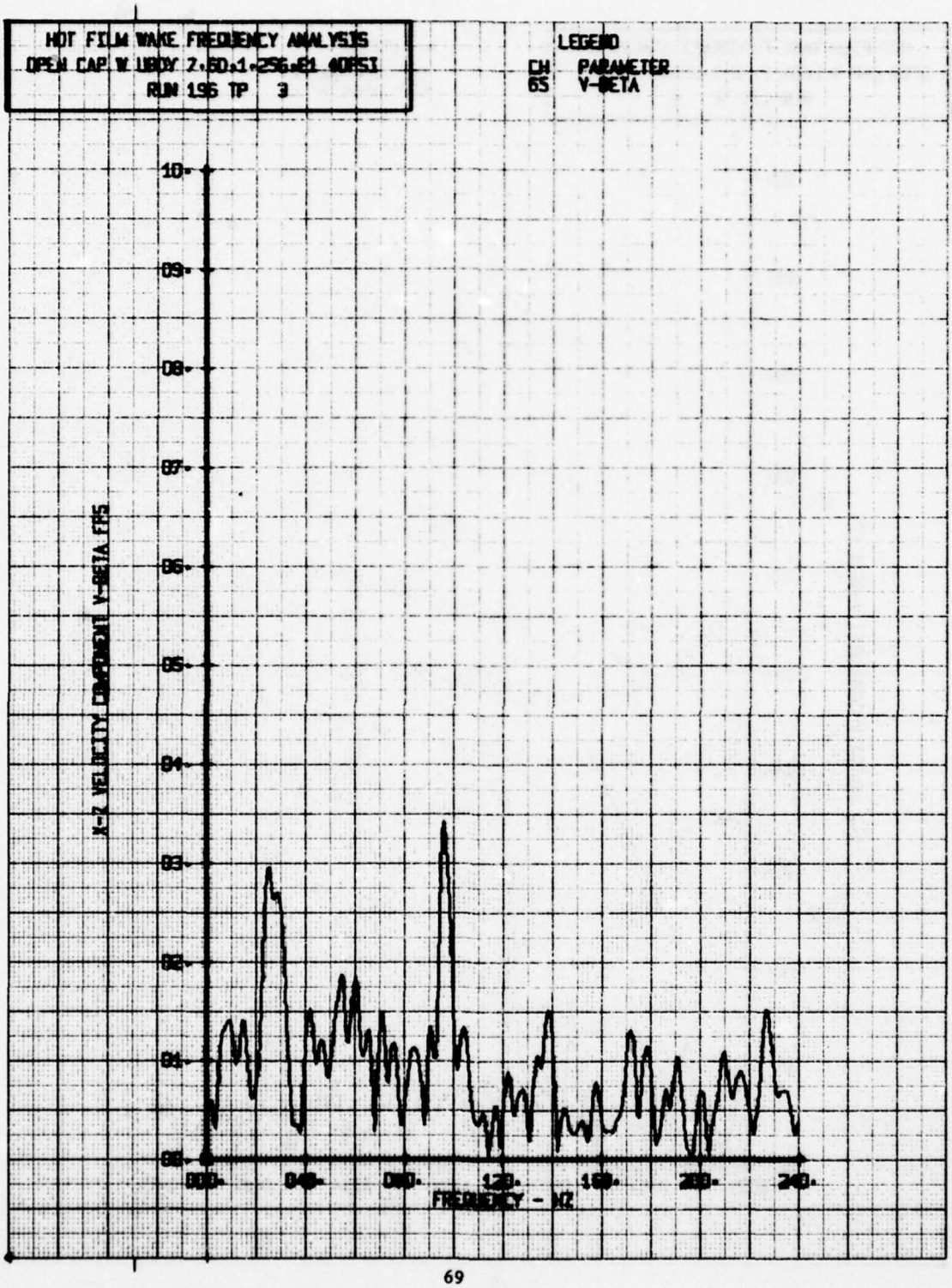
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 2.6D.1-256.E1 40PSI
RUN 196 TP 3
LEGEND
CH PARAMETER
65 V-BETA
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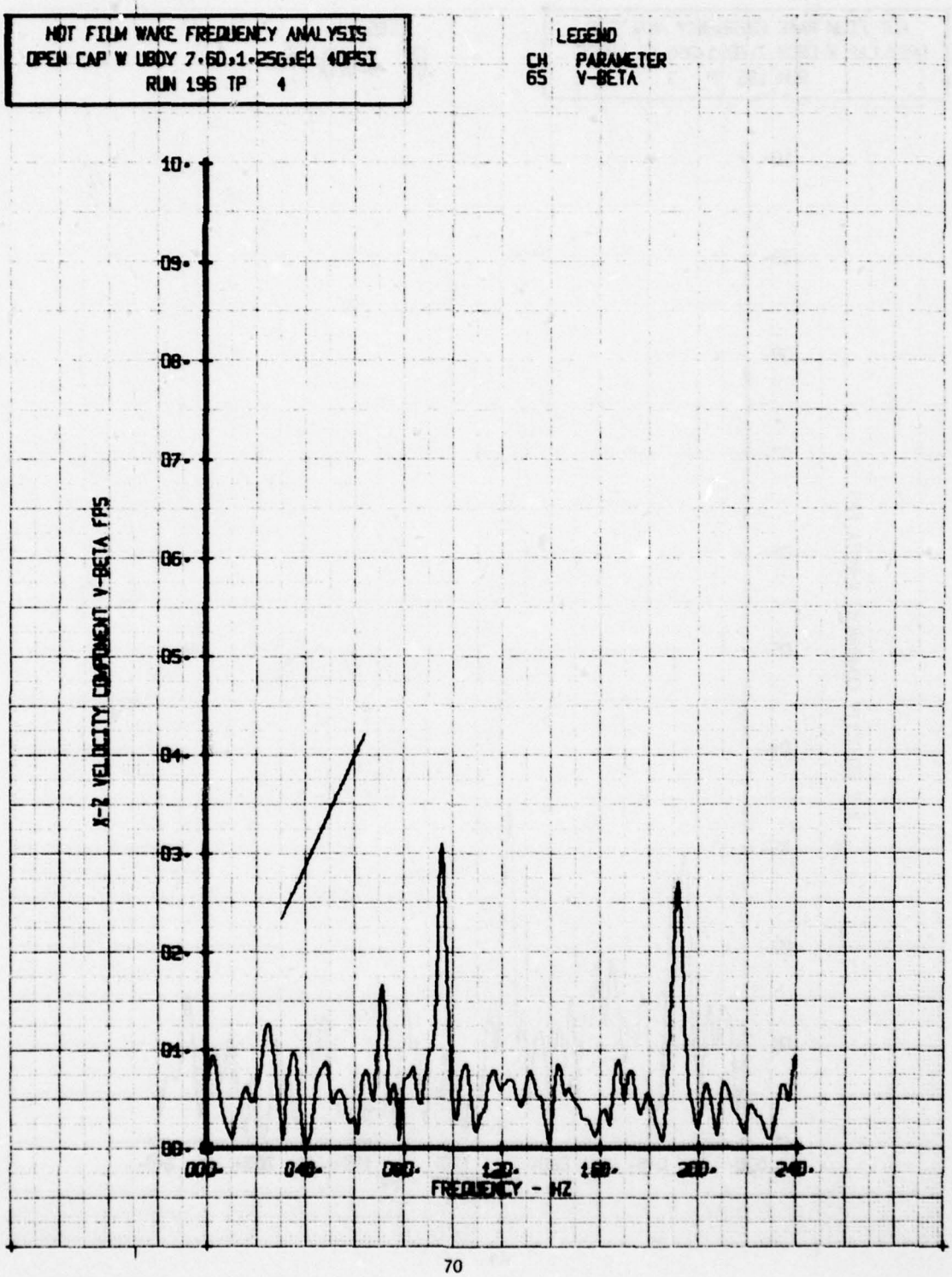
FREQUENCY - HZ
X-Z VELOCITY COMPONENT V-BETA RMS


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.6D,1.25G,E1 40PSI
RUN 196 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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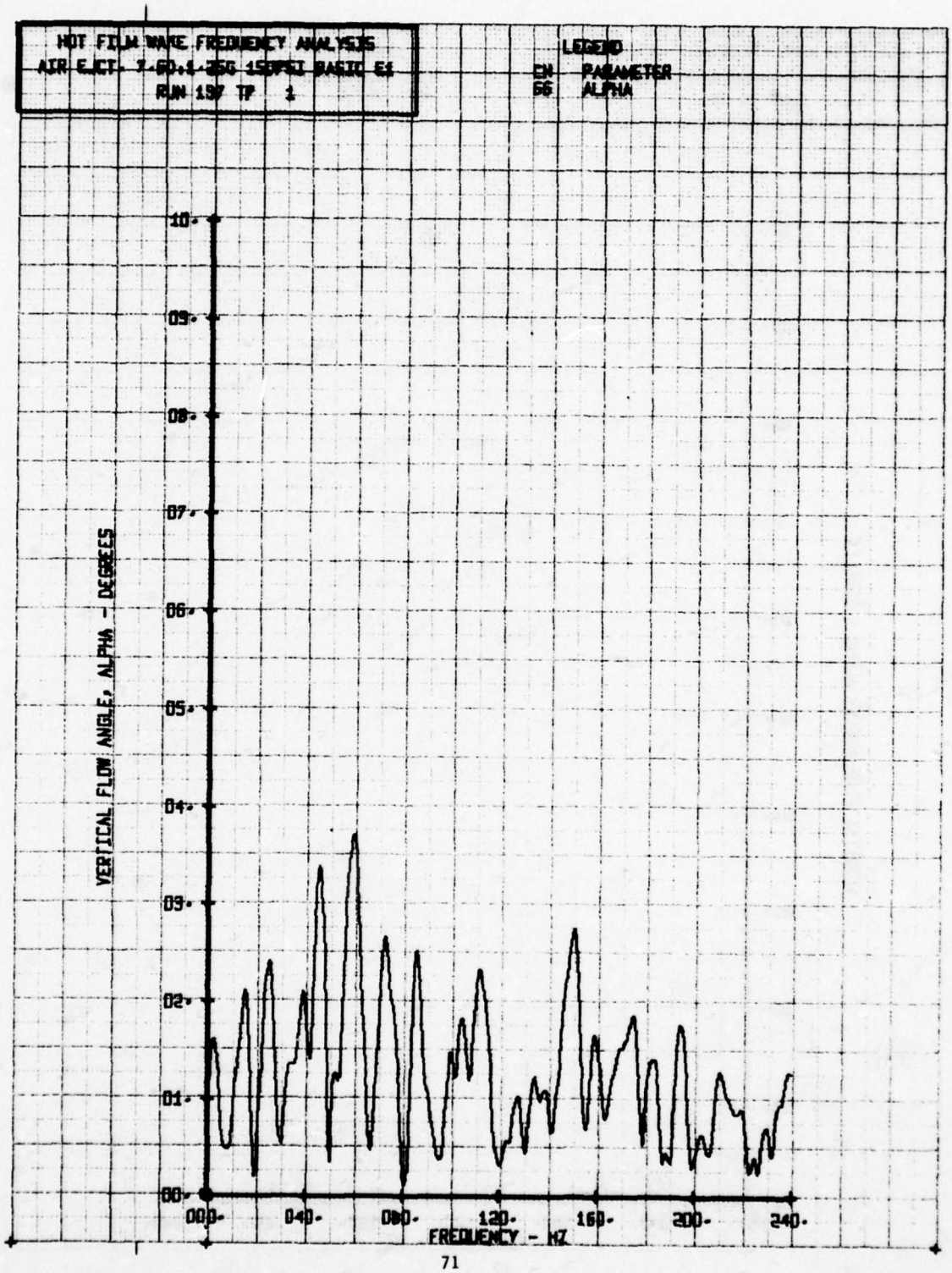
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 1-60,1-25G 15PSI BASIC ES
RUN 197 TP 1
LEGEND
CN PARAMETER
66 ALPHA
10.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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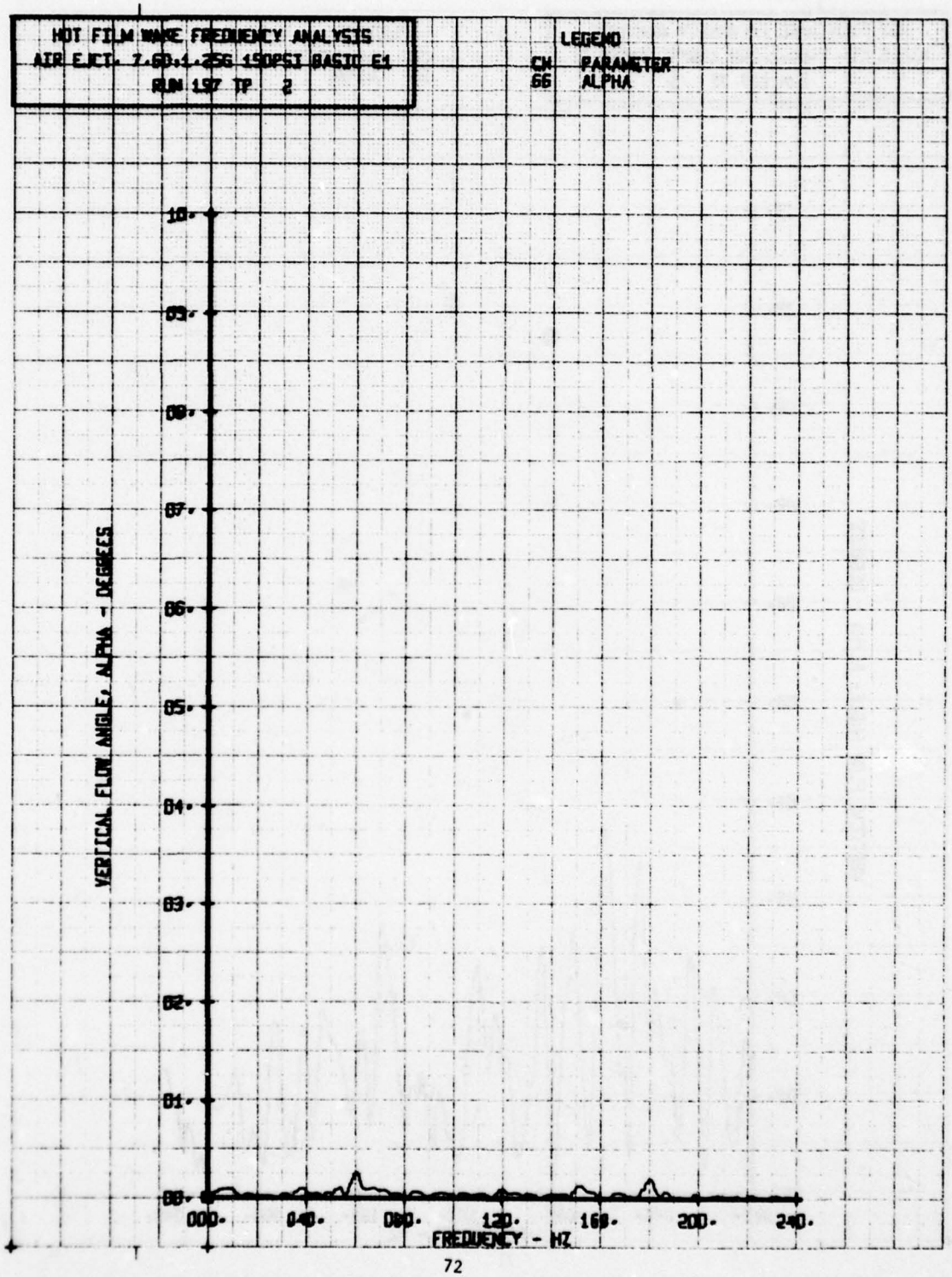
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60:1.25G 150PSI BASIC E1
RUN 157 TP 2
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
10.
09.
08.
07.
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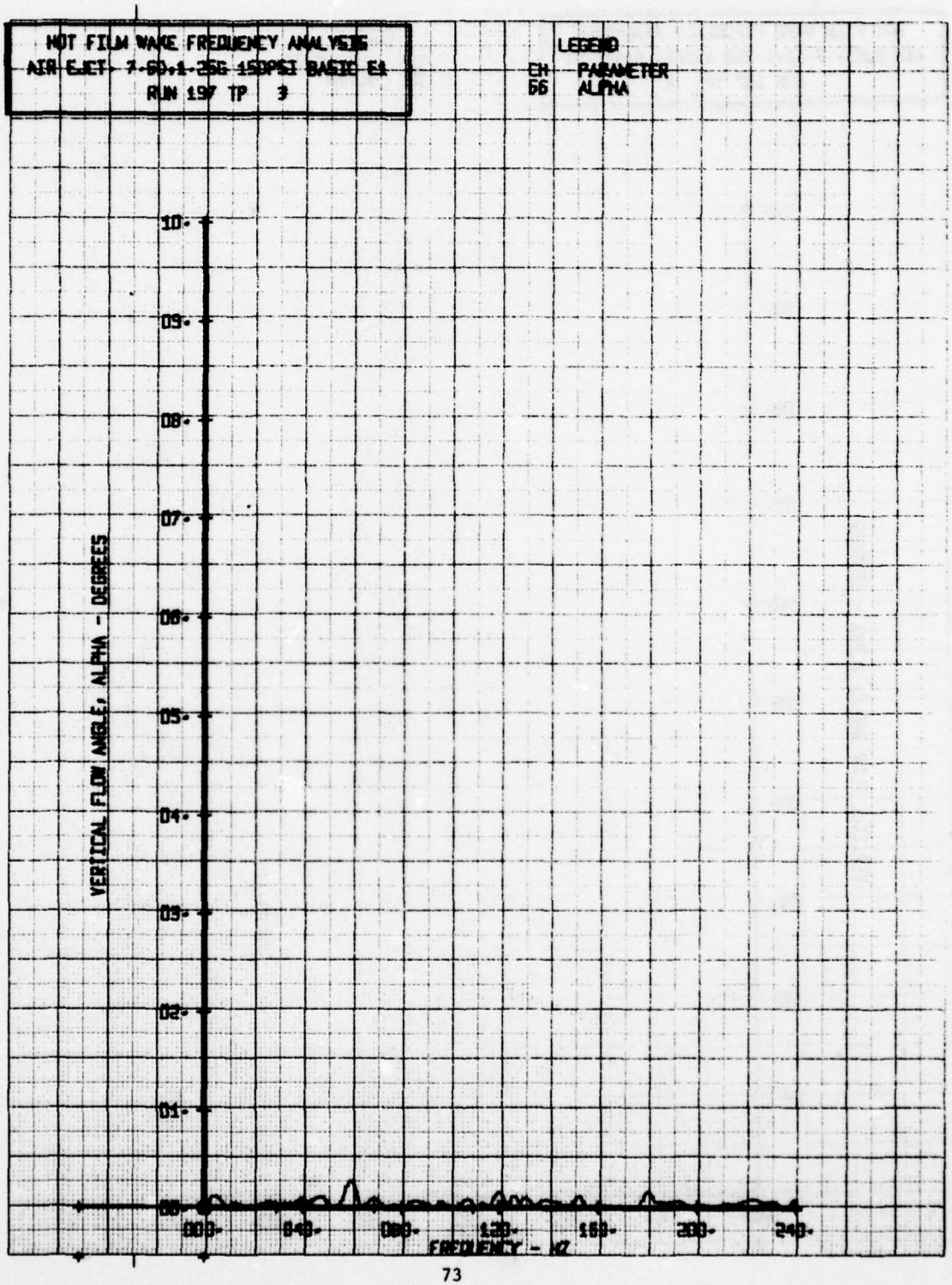
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJET- 7-60,1-25G 150PSI BASIC E1
RUN 197 TP 3
LEGEND
CH PARAMETER
66 ALPHA
10.
09.
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07.
06.
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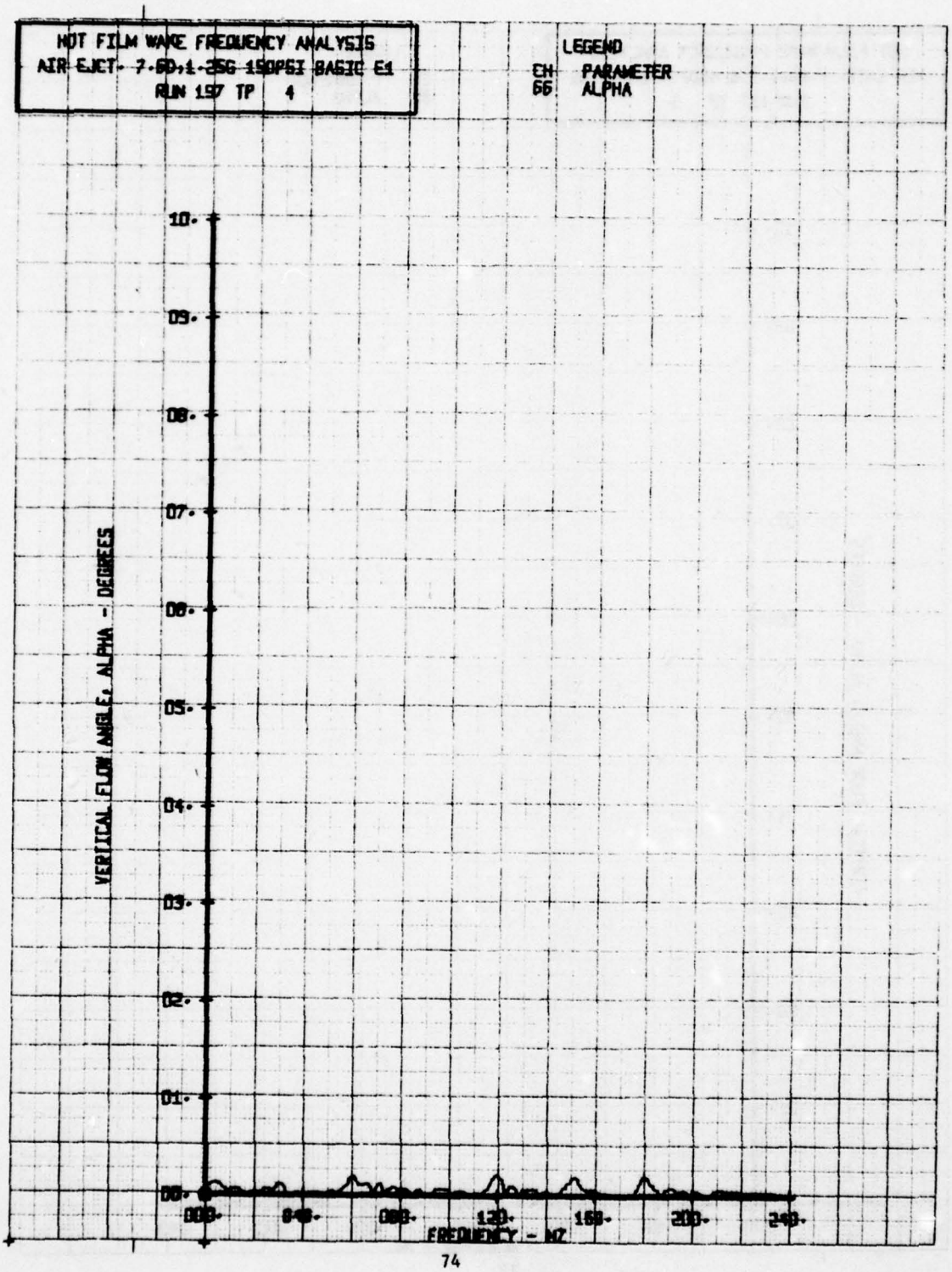
02.
01.
00.
VERTICAL FLOW ANGLE, ALPHA - DEGREES
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7.6D,1.25G 150PSI BASIC E1
RUN 197 TP 4
LEGEND
CH PARAMETER
66 ALPHA
10.
09.
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06.
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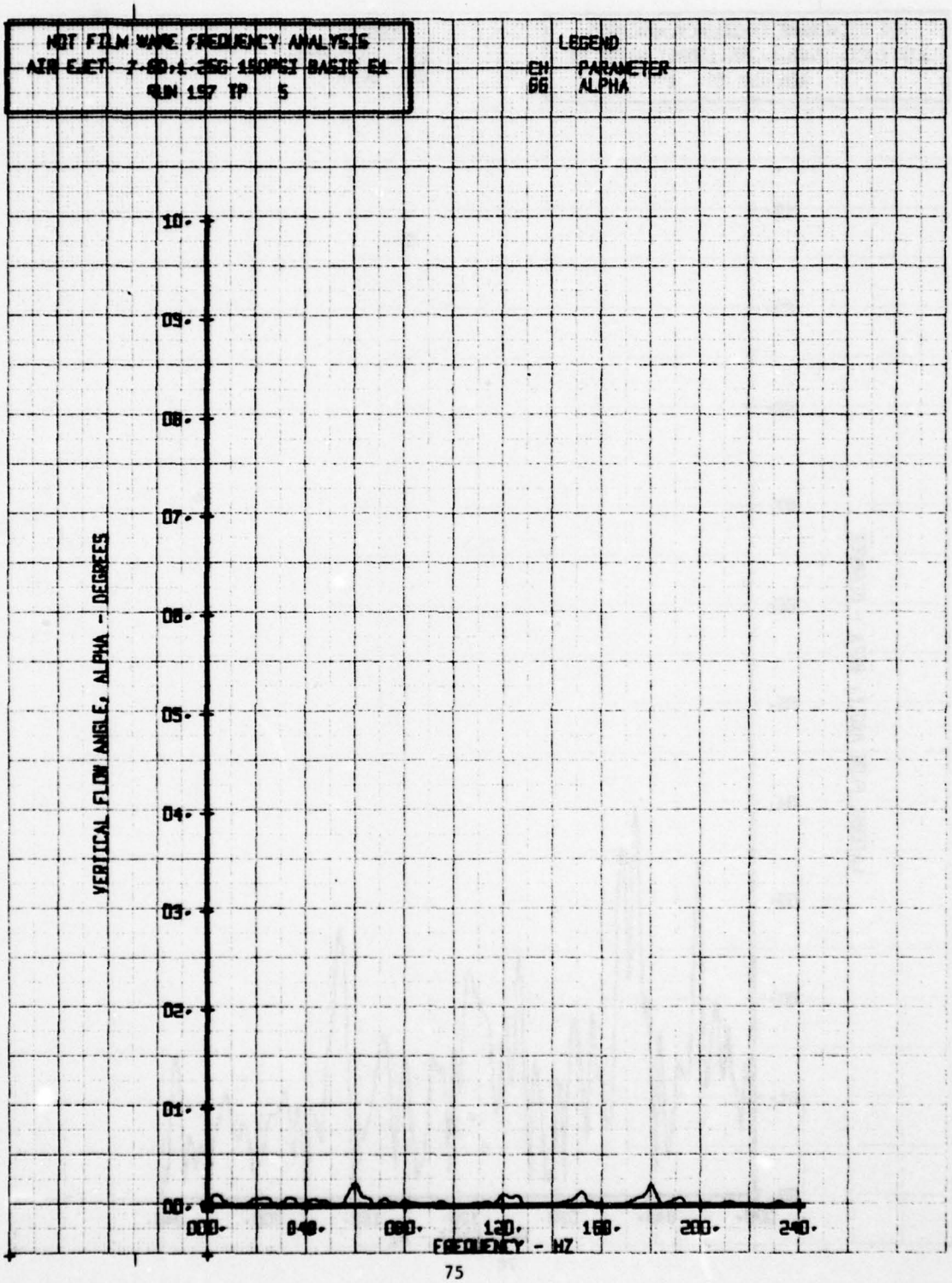
VERTICAL FLOW ANGLE, ALPHA - DEGREES
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJET 7.60.1.250 150PSI BASIC E4
RUN 157 TP 5
LEGEND
CH PARAMETER
66 ALPHA
10.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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080.
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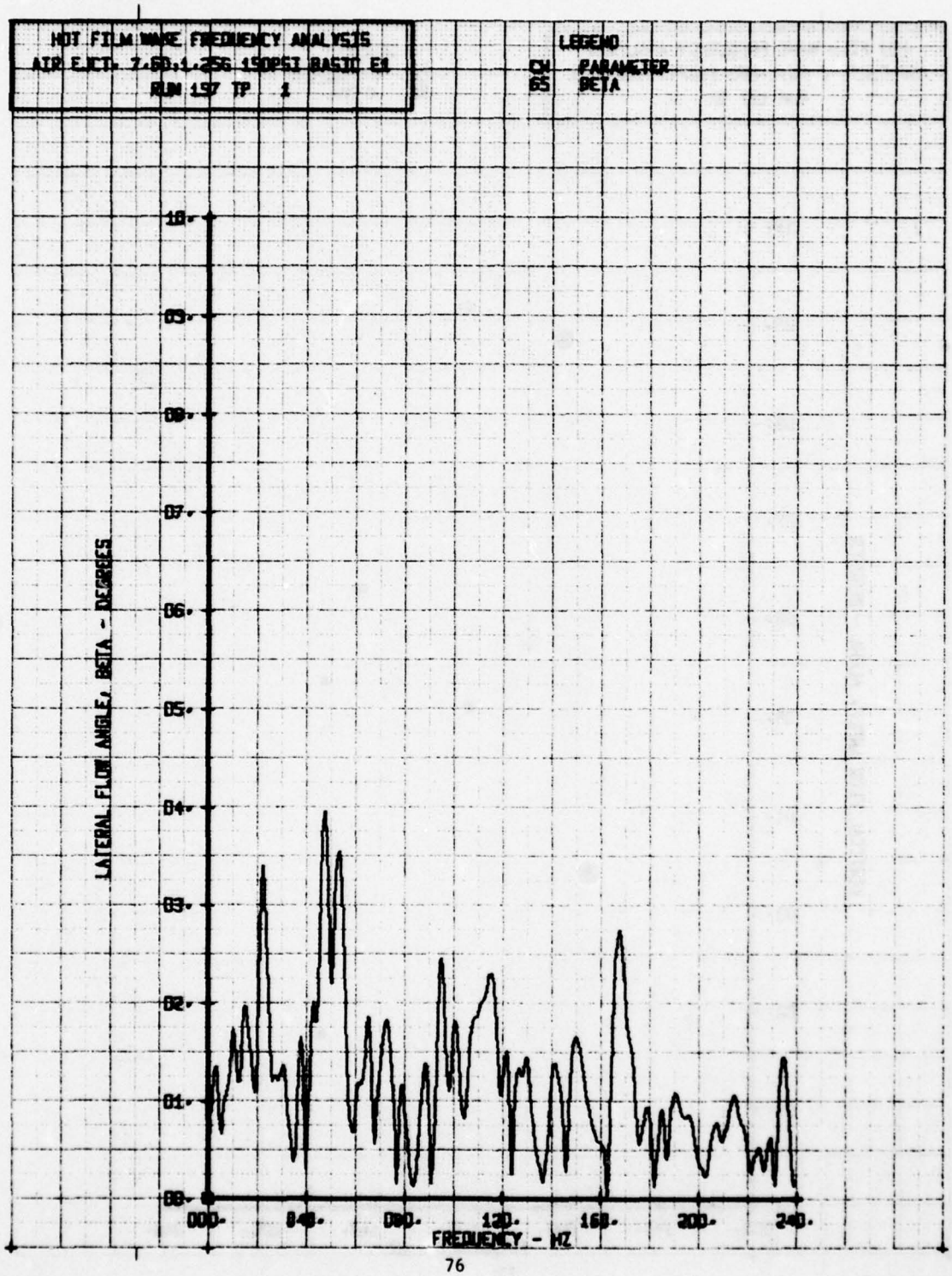
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60:1.256 150PSI BASIC E8
RUN 157 TP 1
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
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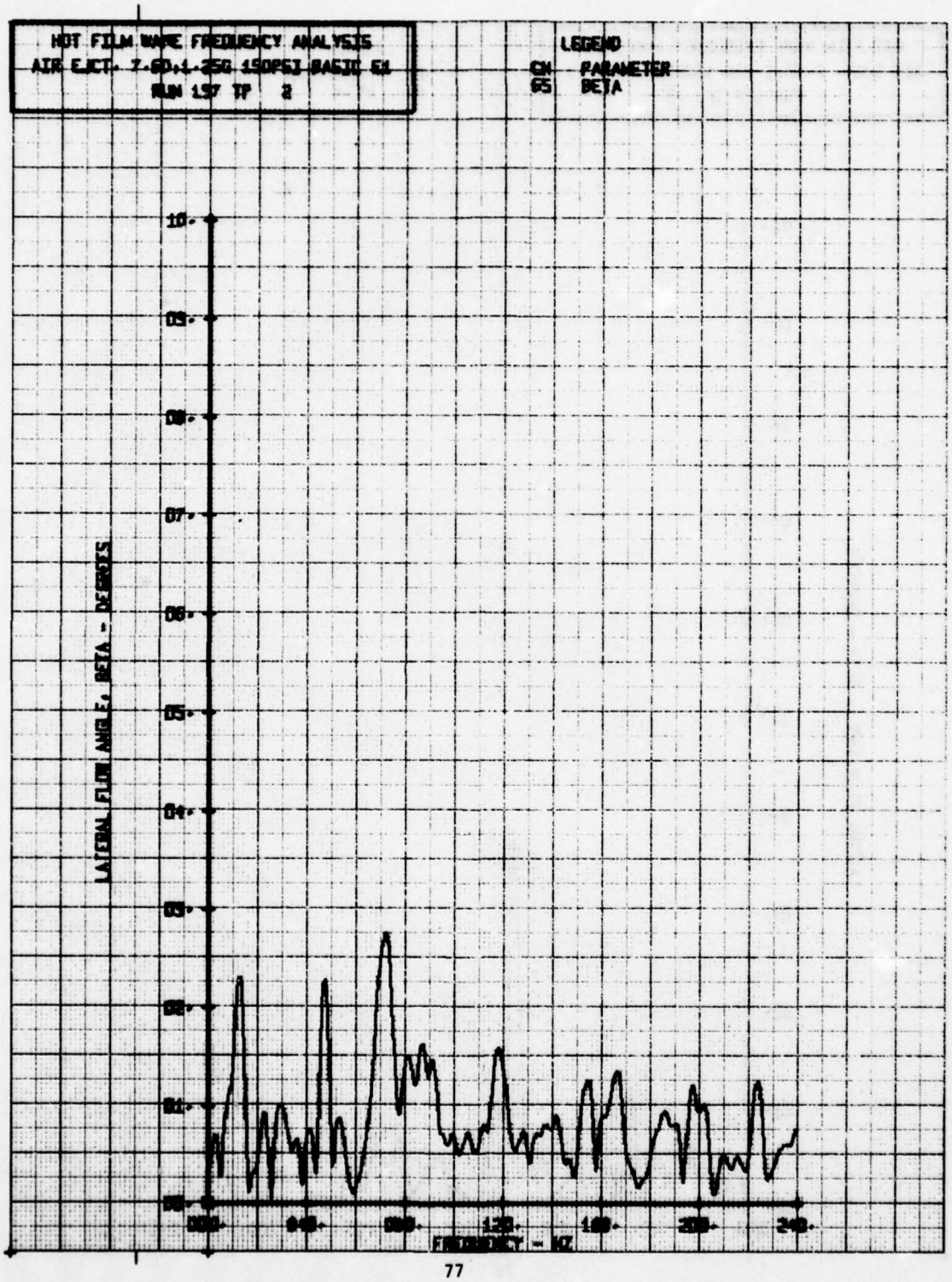
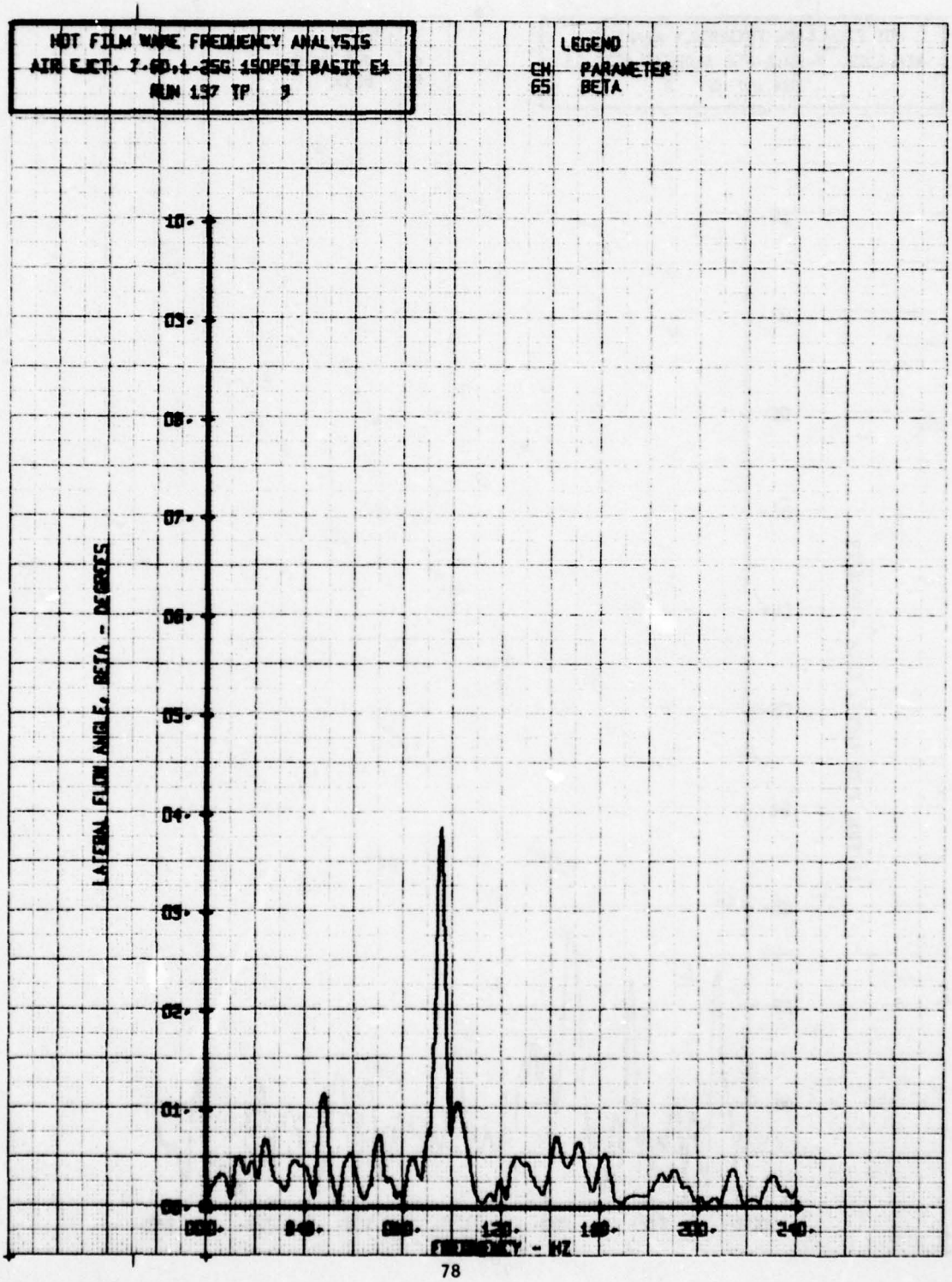
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.6D,1.25D 150PSI BASIC 61
RUN 157 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-60,1-25G 150PSI BASIC E1
RUN 157 TP 3
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
09.
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03.
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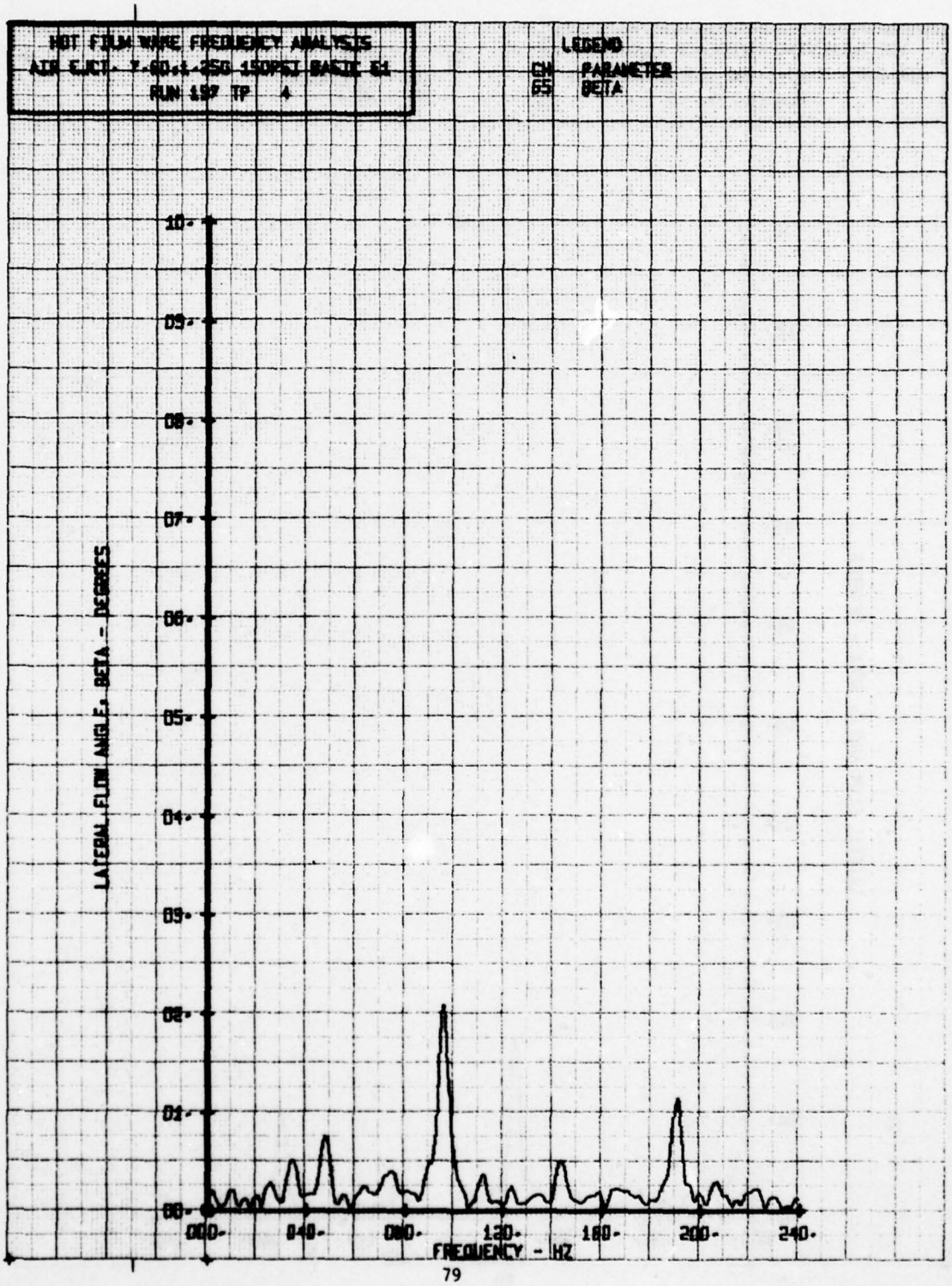
120.
140.
160.
180.
200.
220.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. Y-60.1.25G 150PSI BASIC 61
RUN 197 TP 4
LEGEND
CH PARAMETER
65 BETA
10.
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LATERAL FLOW ANGLE, BETA - DEGREES
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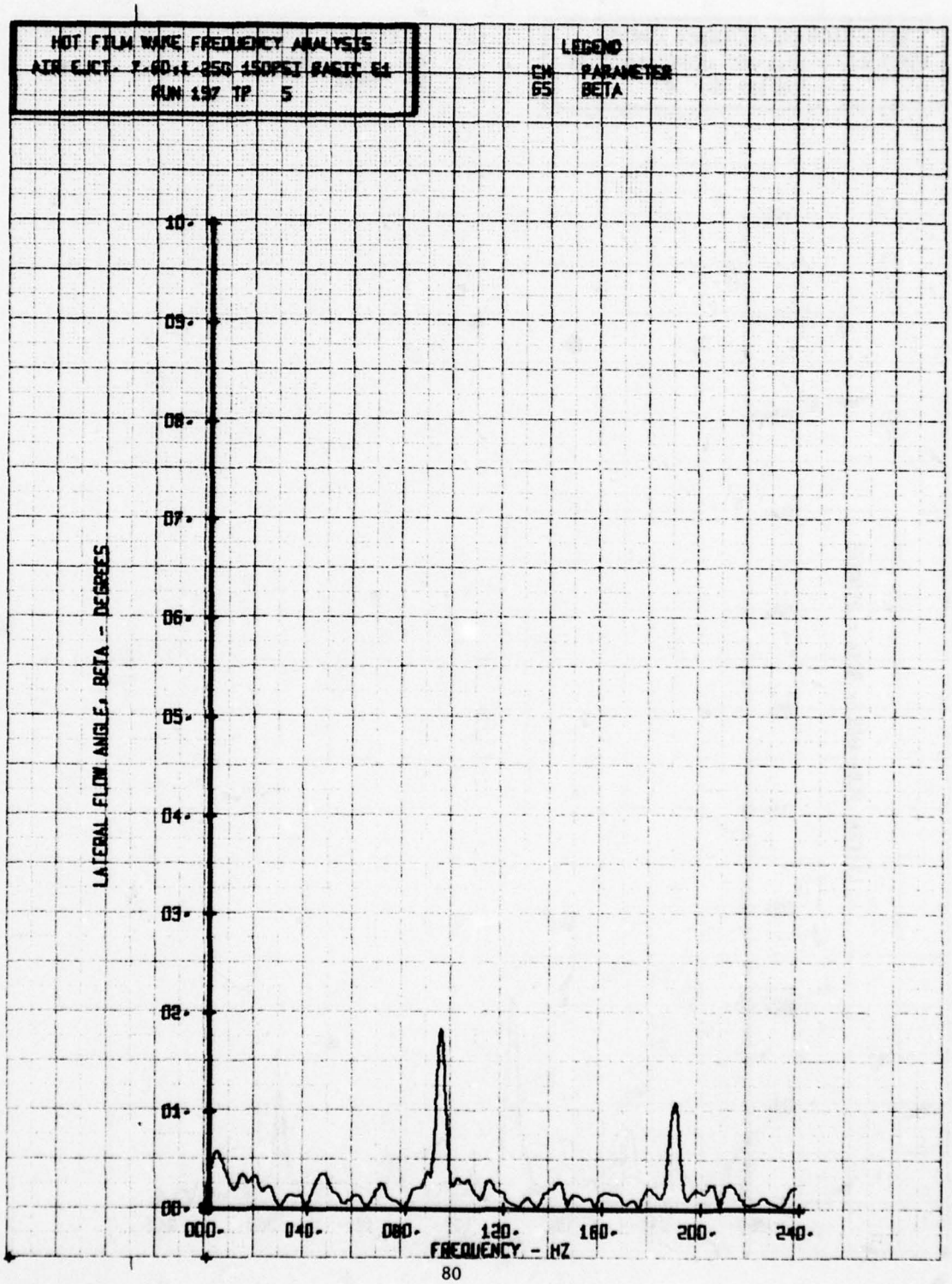
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT - 7-60-1-250 150PSI BASIC 61
RUN 197 TP 5
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
09.
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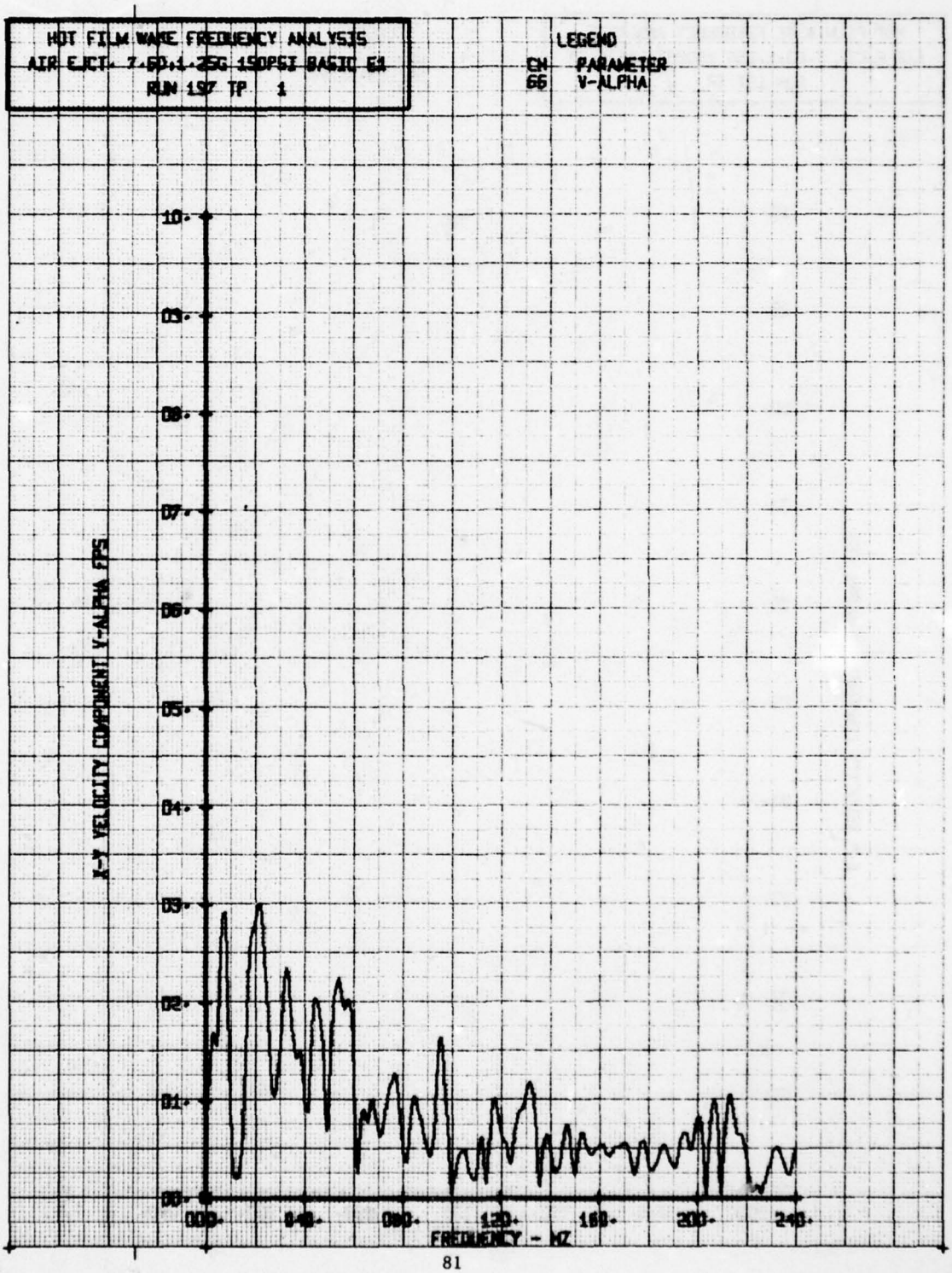
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.25G 150PSI BASIC E1
RUN 197 TP 1
LEGEND
CH PARAMETER
66 V-ALPHA
X-Y VELOCITY COMPONENT Y-ALPHA FPS
10.
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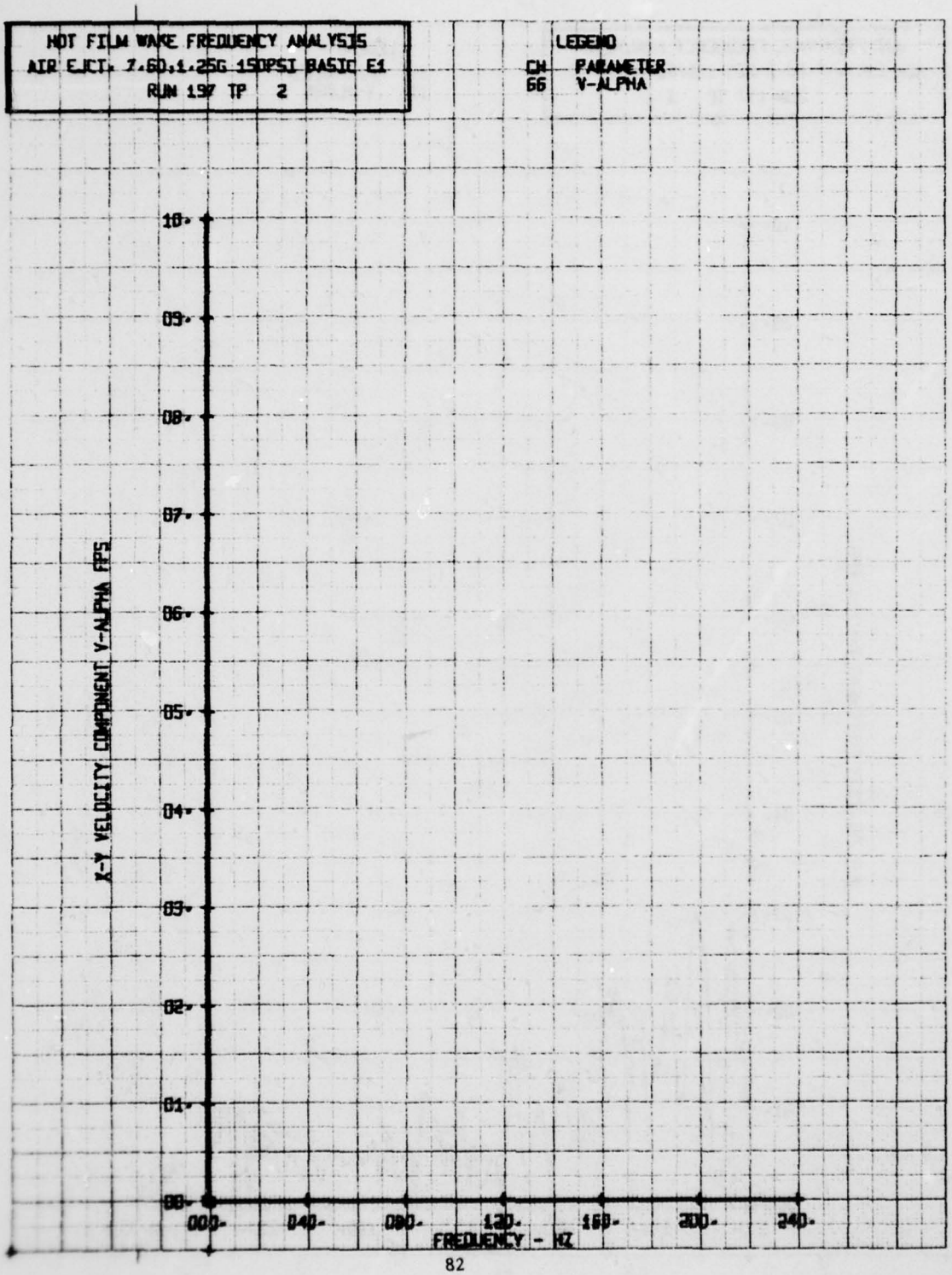
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 1.60,1.25G 150PSI BASIC E1
RUN 197 TP 2
LEGEND
CH PARAMETER
66 V-ALPHA
10.
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X-Y VELOCITY COMPONENT V-ALPHA FPS
000.
040.
080.
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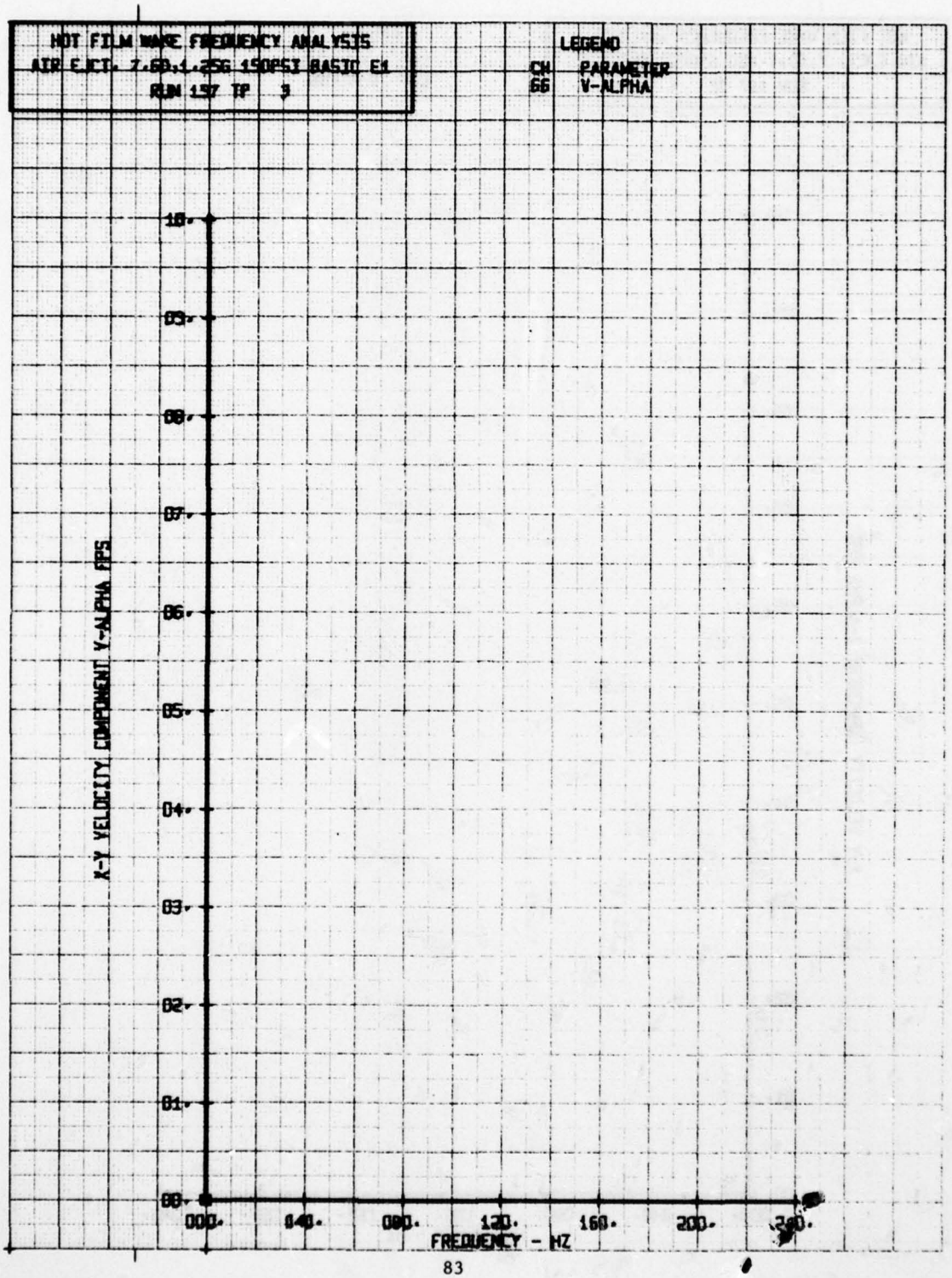
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60.1.25G 150PSI BASIC E4
RUN 157 TP 3
LEGEND
CH PARAMETER
66 V-ALPHA
10.
09.
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X-Y VELOCITY COMPONENT V-ALPHA FPS
000.
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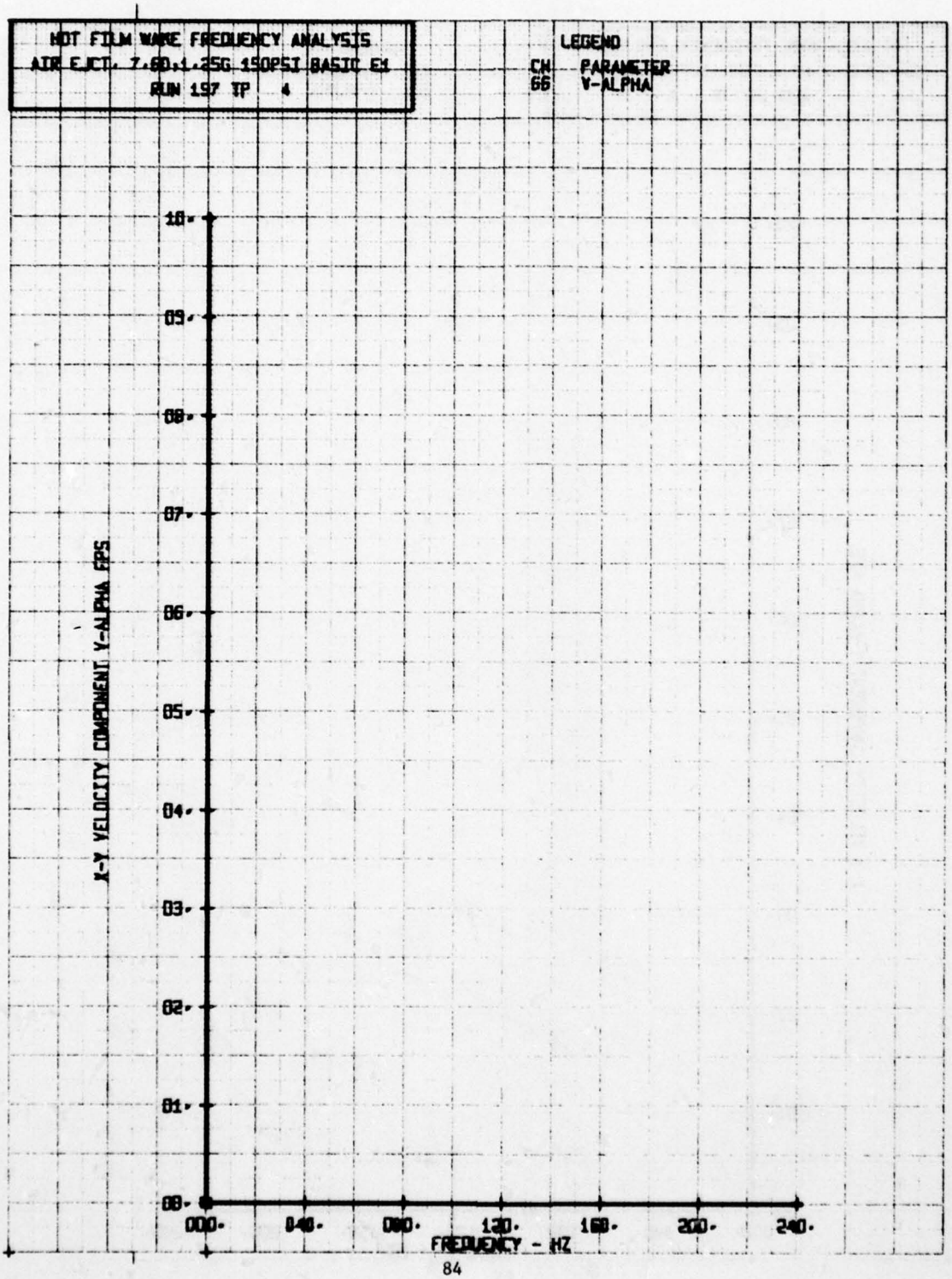
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.25G 150PSI BASIC E1
RUN 197 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
10.
09.
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X-Y VELOCITY COMPONENT V-ALPHA FPS
000.
040.
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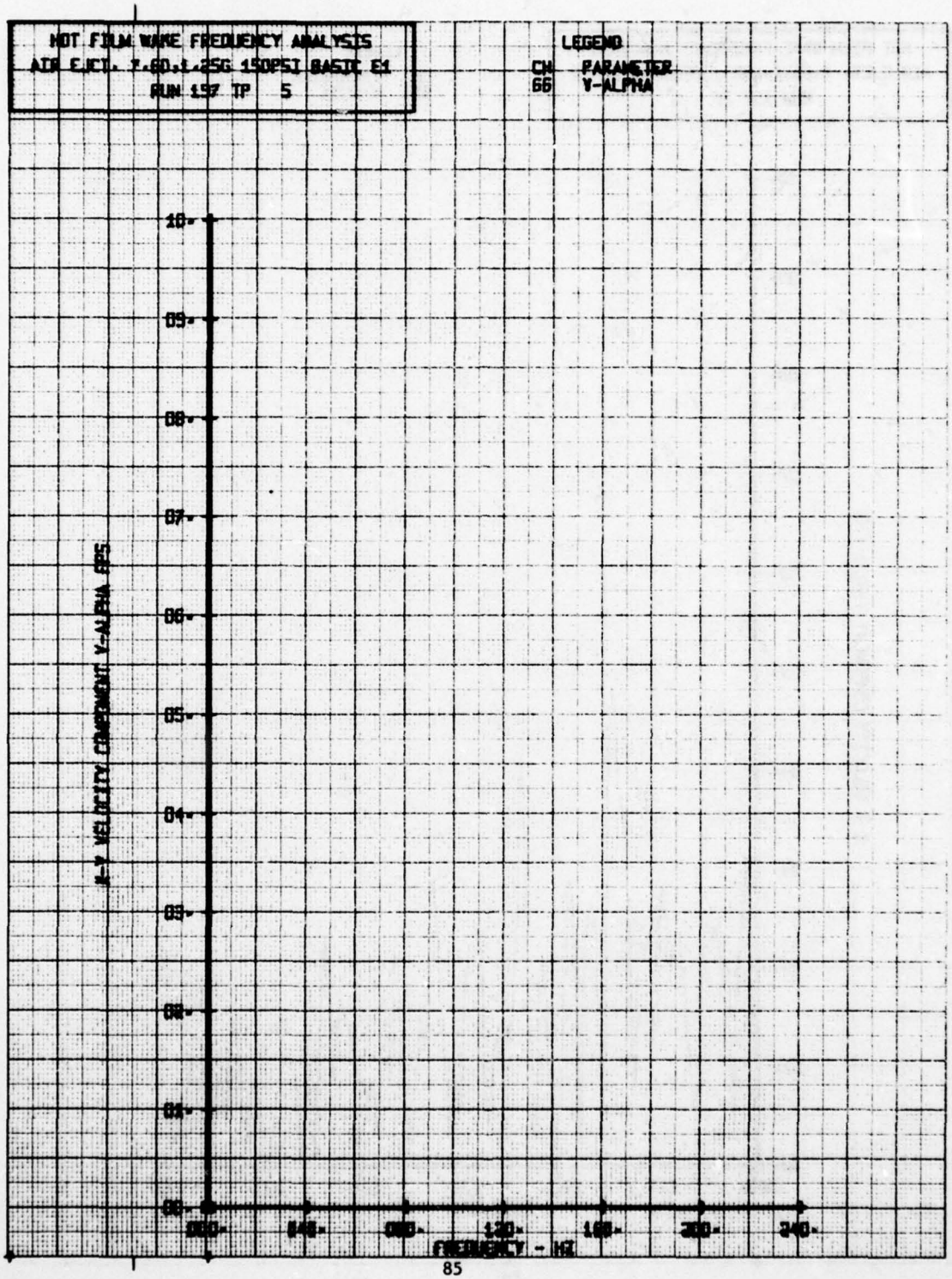
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60.1.25G 150PSI BASIC E1
RUN 157 TP 5
LEGEND
CH PARAMETER
66 V-ALPHA
10
09
08
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06
05
04
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000
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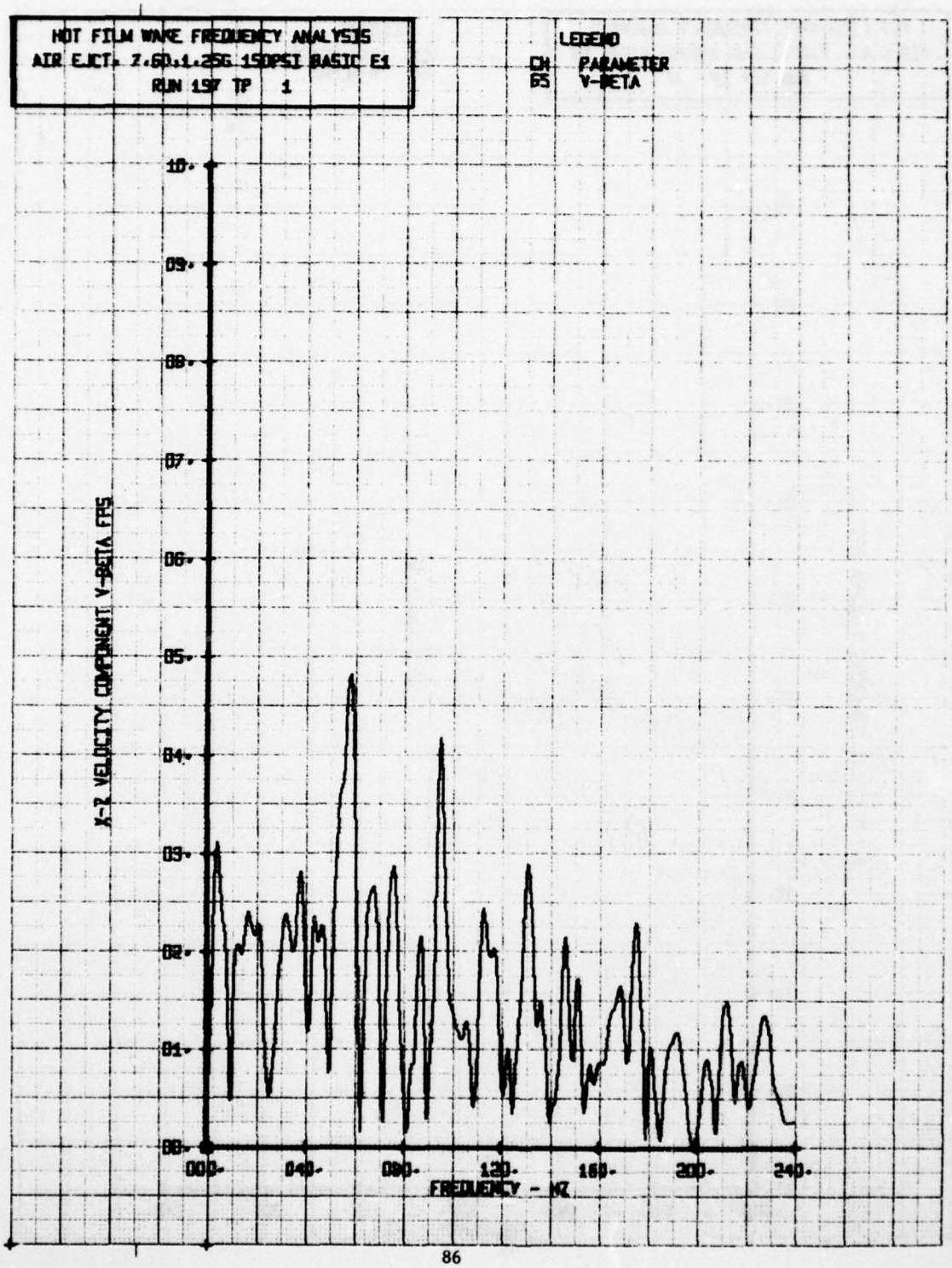
080
120
160
200
240
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.6D.1.25G 150PSI BASIC E1
RUN 157 TP 1
LEGEND
CH PARAMETER
65 V-BETA
10.
09.
08.
07.
06.
05.
04.
03.
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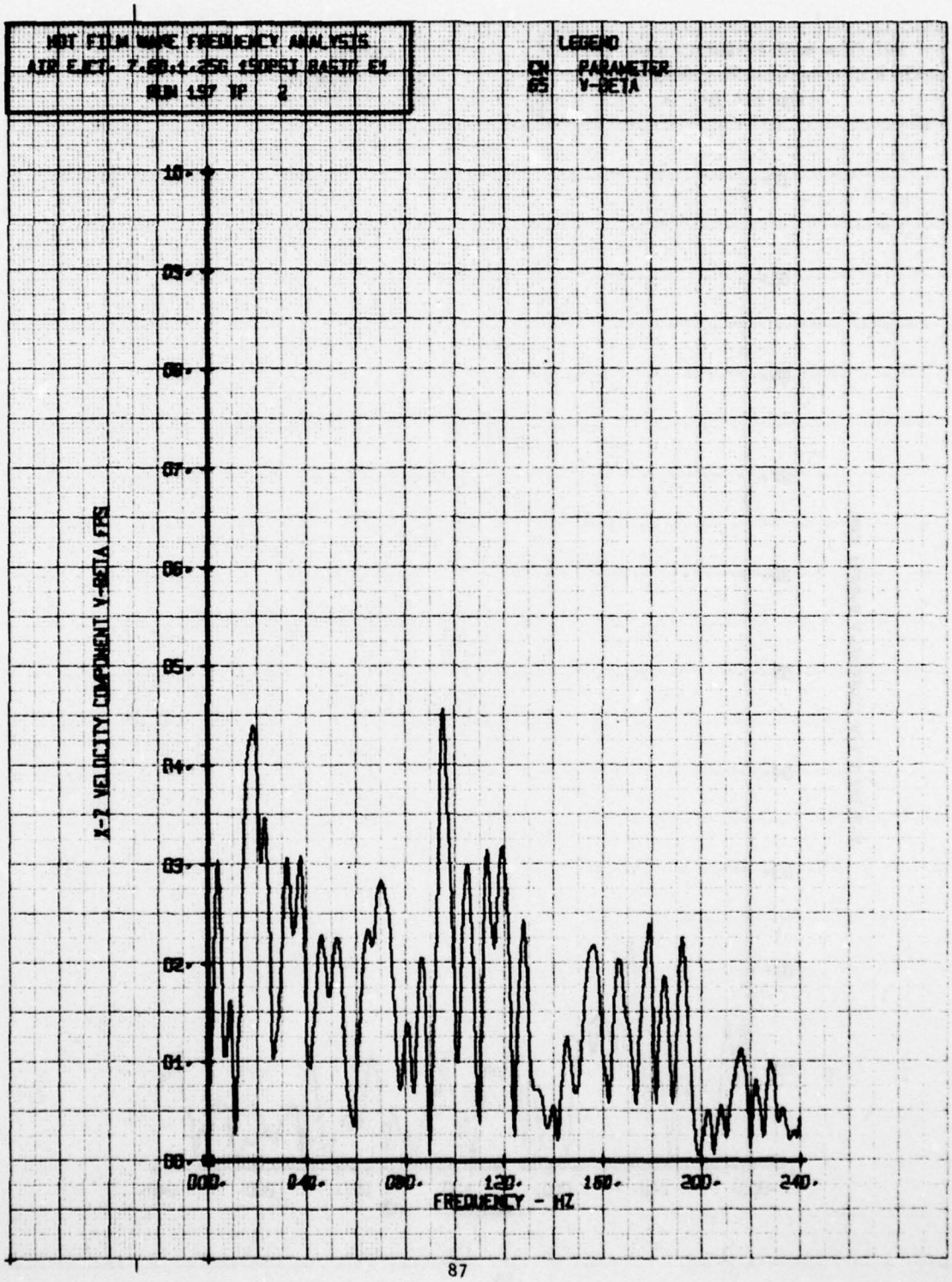
01.
00.
X-Z VELOCITY COMPONENT V-BETA FRS
000.
040.
080.
120.
160.
200.
240.
FREQUENCY - KZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60:1.25G 150PSI BASIC E1
RUN 197 TP 2
LEGEND
CH PARAMETER
05 V-BETA
X-2 VELOCITY COMPONENT V-BETA FPS
10.
09.
08.
07.
06.
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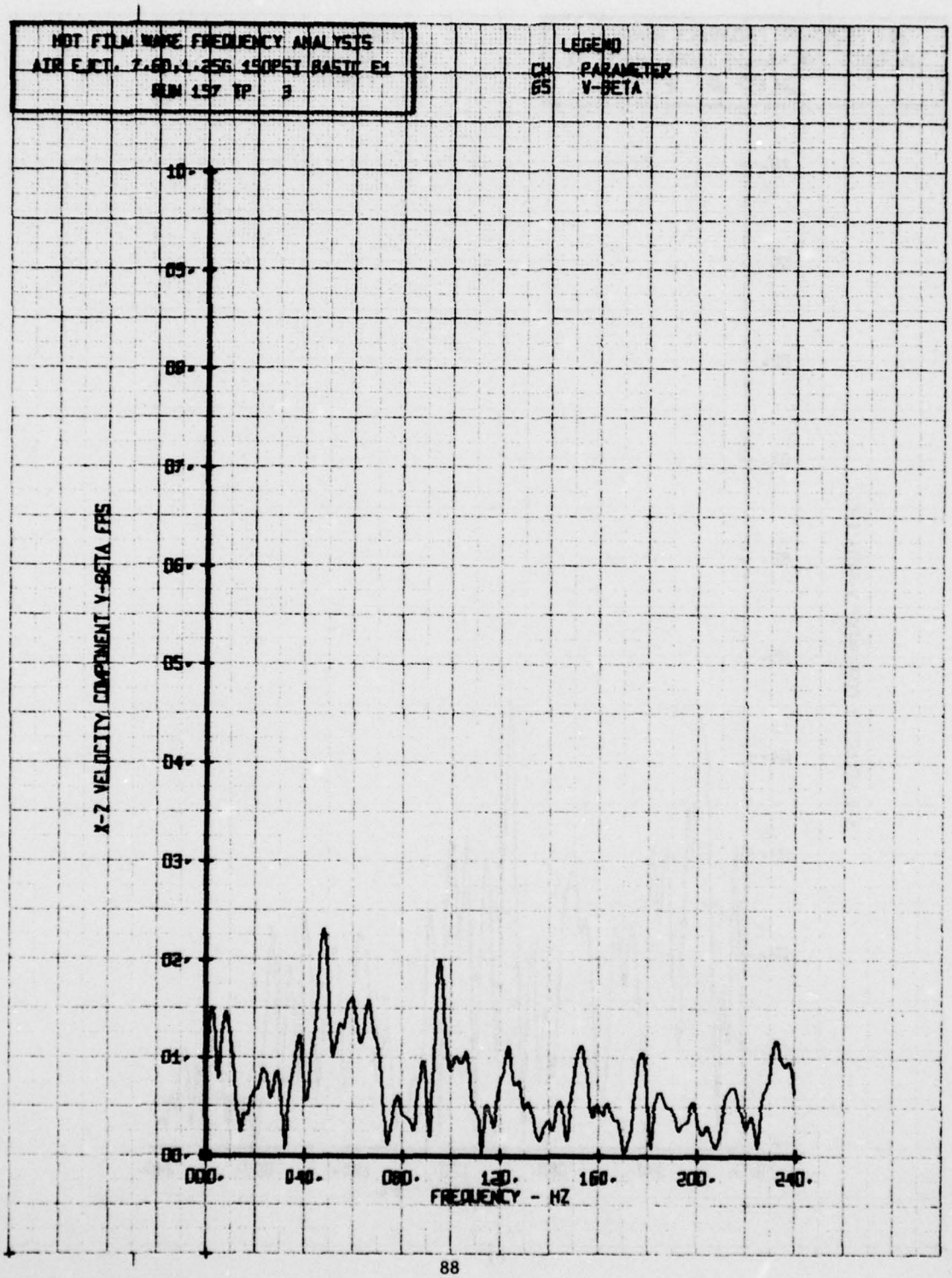
040.
080.
120.
160.
200.
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.25G 150PSI BASIC E1
RUN 157 TP 3
LEGEND
CH PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA CPS
10.
09.
08.
07.
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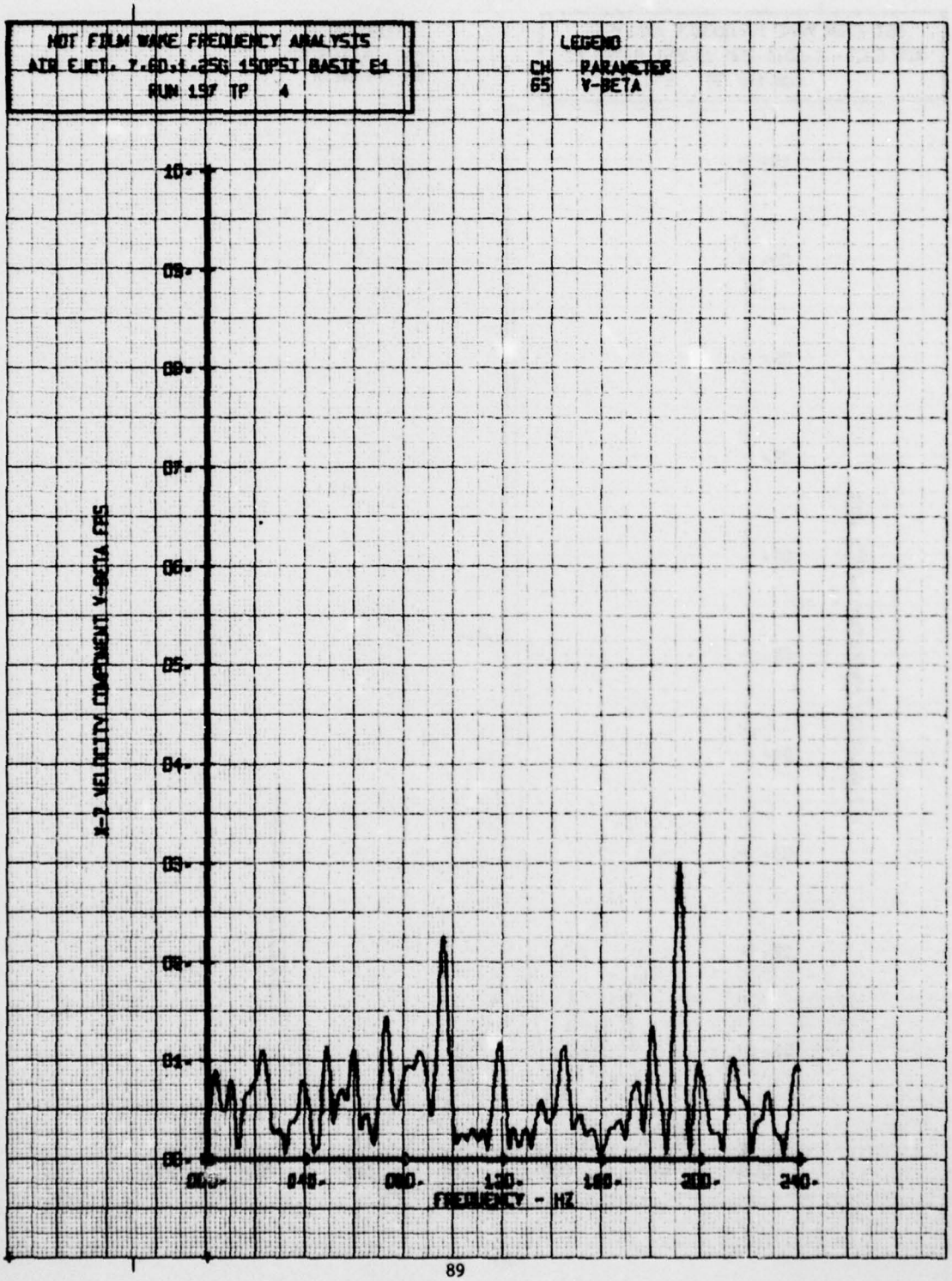
160.
200.
240.
FREQUENCY - HZ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AIR EJCT. 7.60.1.25G 150PSI BASIC E1
RUN 197 TP 4
LEGEND
CH PARAMETER
65 V-BETA
10-
09-
08-
07-
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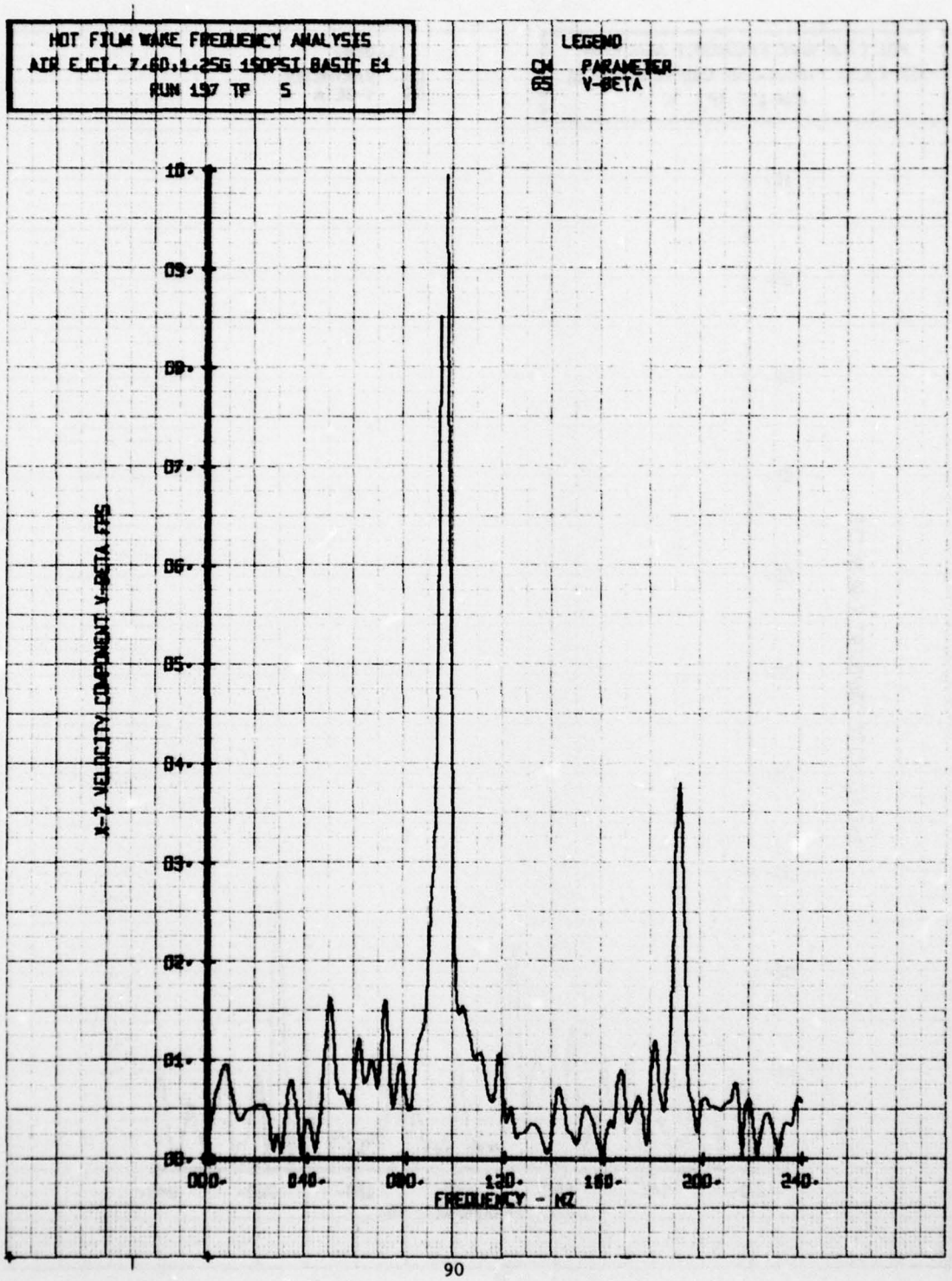
X-2 VELOCITY COMPONENT V-BETA CRS
000-
060-
120-
180-
240-
FREQUENCY - HZ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AIR EJCT. Z/D=0.1.25G 150PSI BASIC E1
RUN 197 TP 5
LEGEND
CH PARAMETER
65 V-BETA
10.
09.
08.
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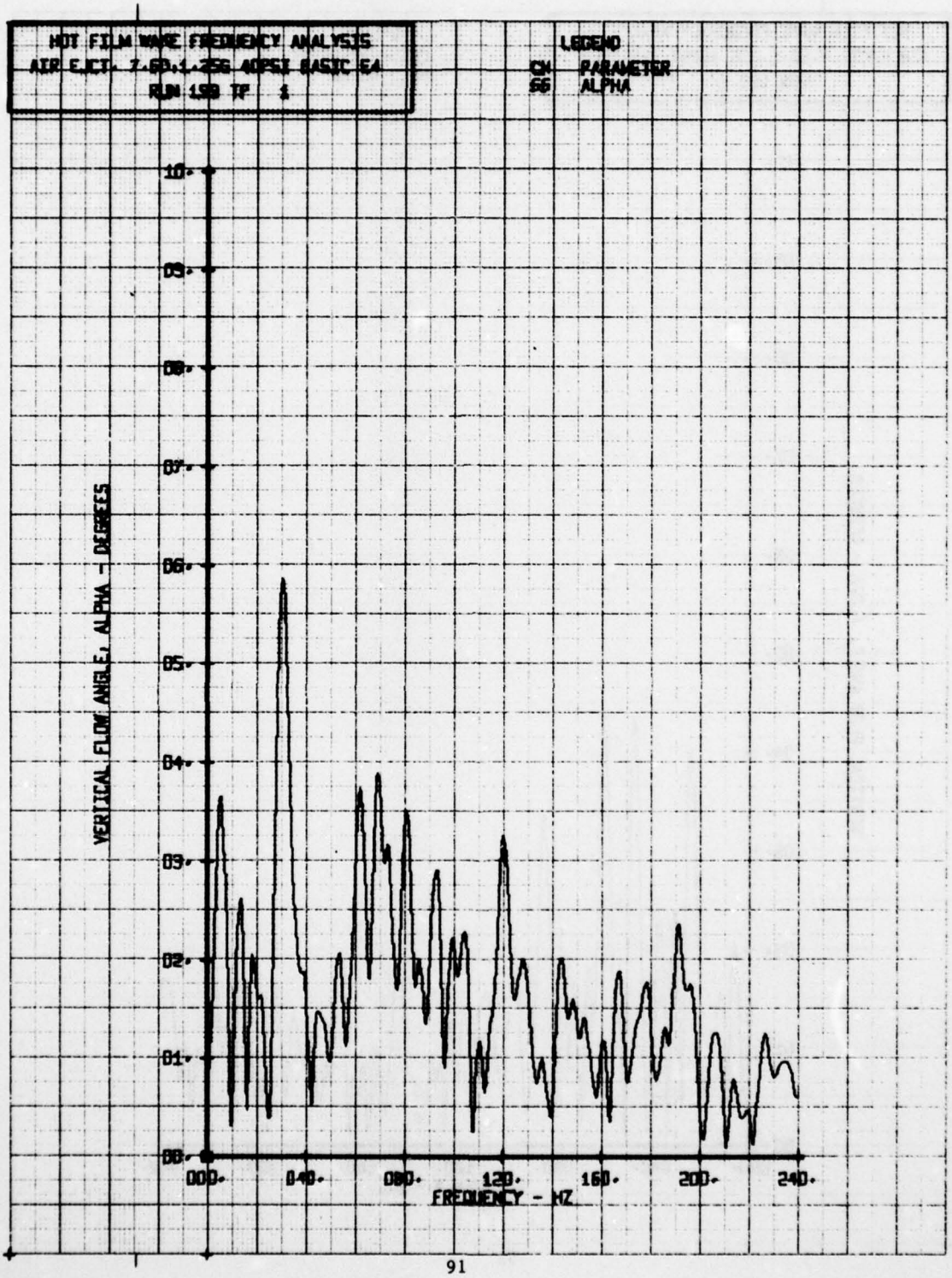
240.
FREQUENCY - KZ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AIR EJCT. 7.6D.1.25G 40PSI BASIC 64
RUN 158 TF 1
LEGEND
CH PARAMETER
56 ALPHA
10.
09.
08.
07.
06.
05.
04.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
000.
040.
080.
120.
160.
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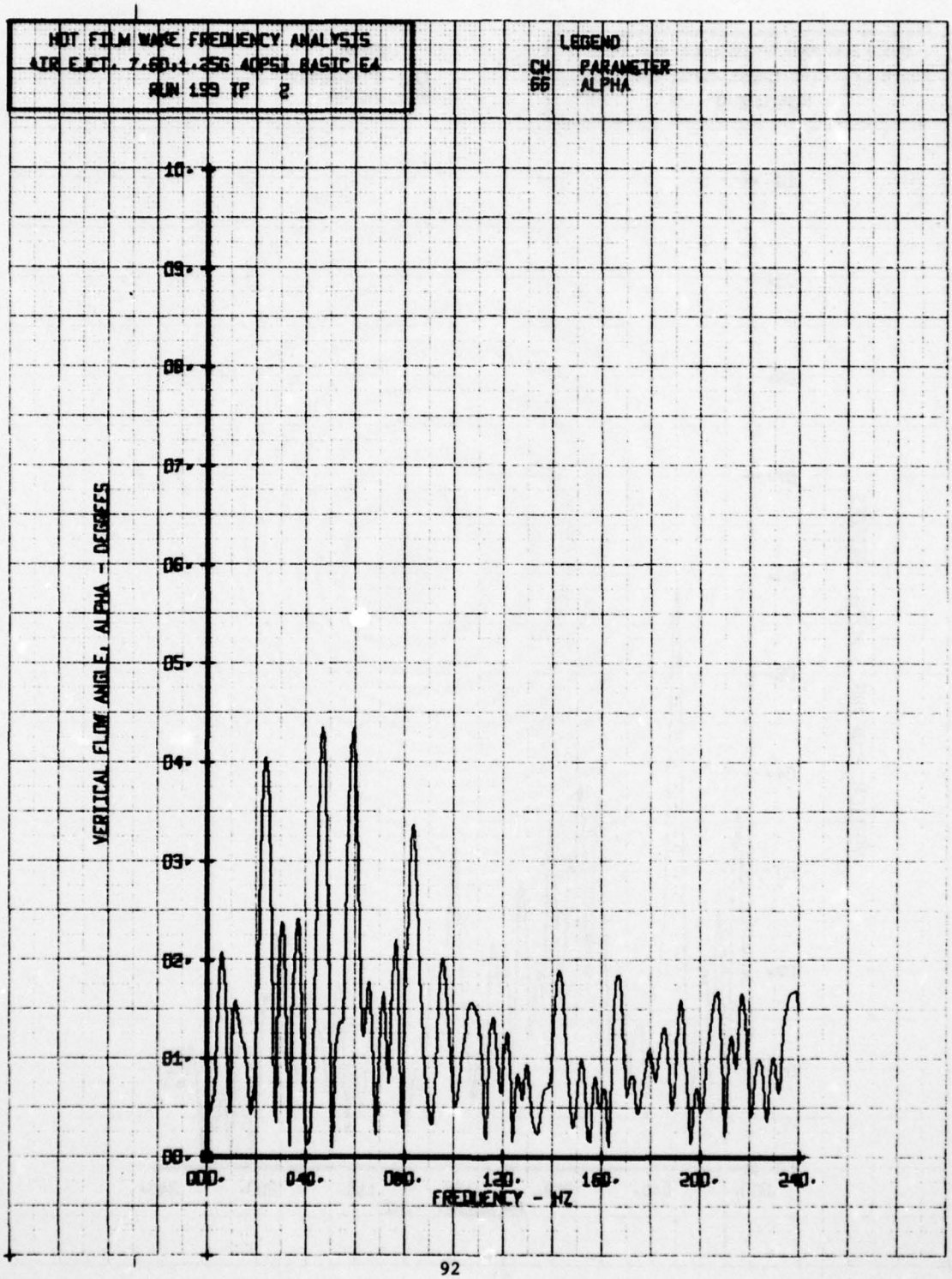
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60,1.25G 40PSI BASIC E4
RUN 199 TP 2
LEGEND
CH PARAMETER
66 ALPHA
10.
09.
08.
07.
06.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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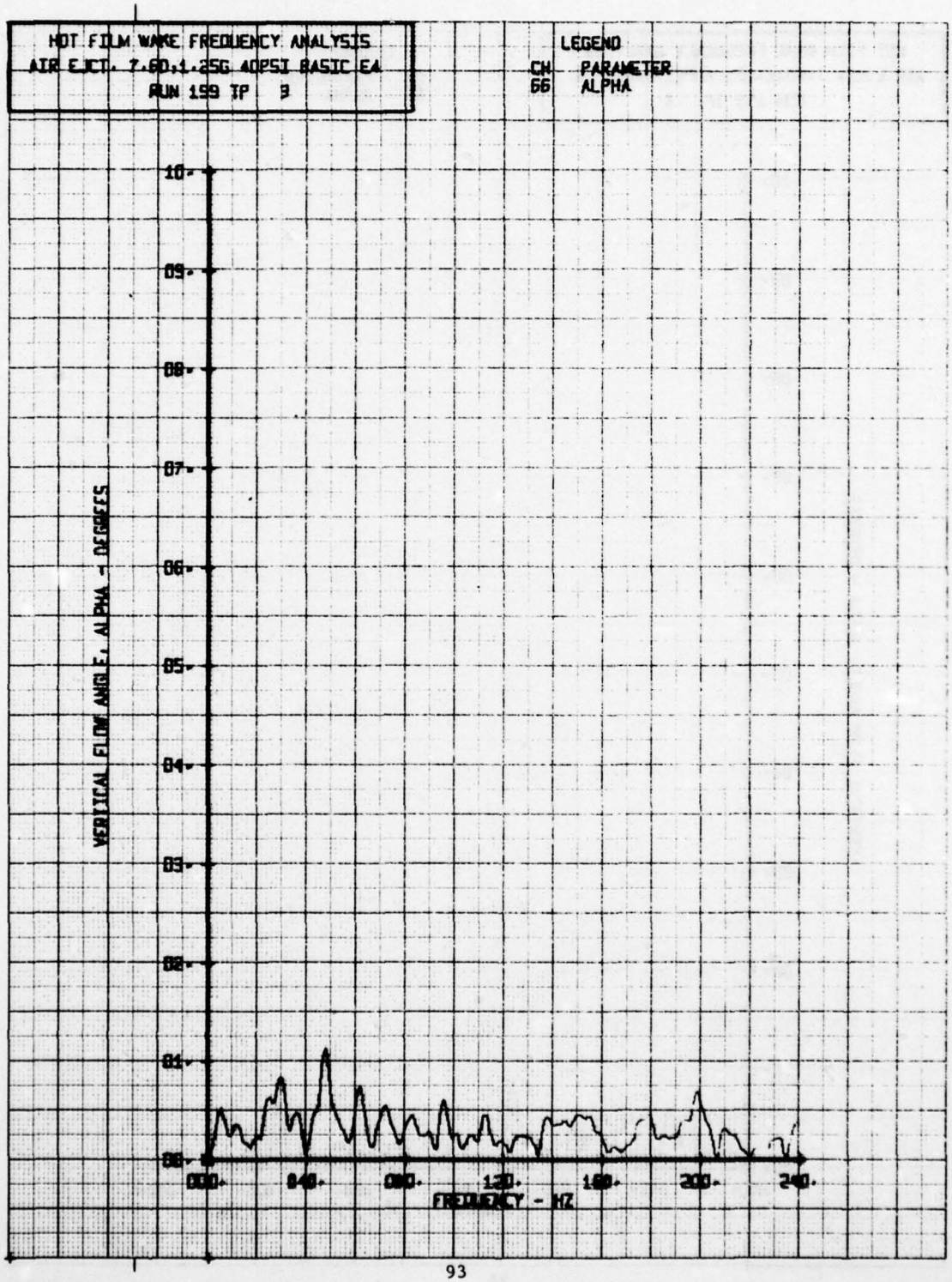
FREQUENCY - HZ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AIR EJCT. 7.6D,1.25G 40PSI BASIC EA
RUN 159 TP 3
LEGEND
CH PARAMETER
66 ALPHA
10.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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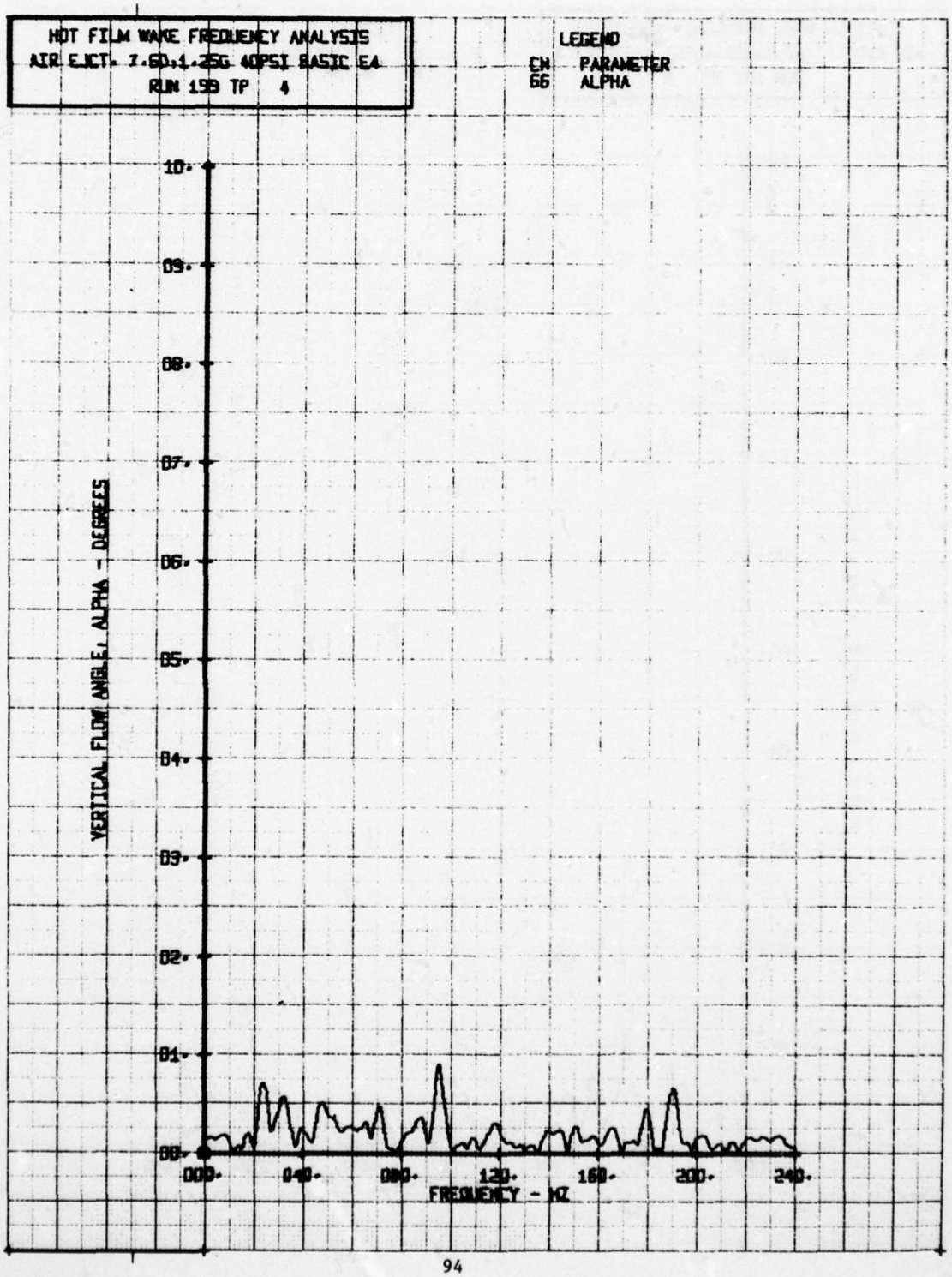
FREQUENCY - HZ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AIR EJCT. 7.5D,1.25G 40PSI BASIC E4
RUN 193 TP 4
LEGEND
CH PARAMETER
66 ALPHA
10.
09.
08.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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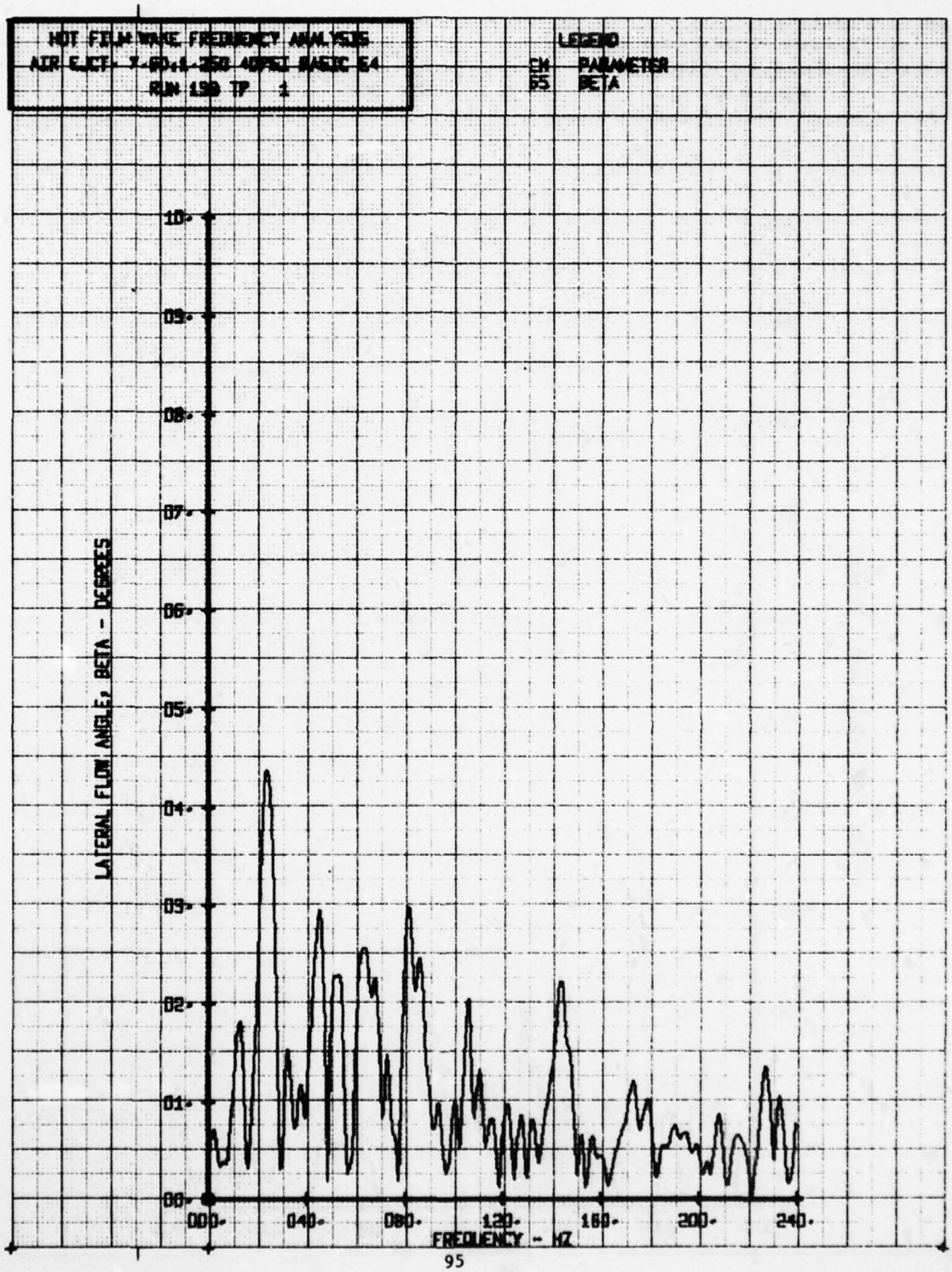
FREQUENCY - HZ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AIR EJCT- 7-60.1-250 ADPEL BASIC 54
RUN 139 TP 1
LEGEND
CH PARAMETER
65 BETA
10.
09.
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06.
05.
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LATERAL FLOW ANGLE, BETA - DEGREES
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240.
FREQUENCY - HZ

AD-A062 117 BOEING VERTOL CO PHILADELPHIA PA F/G 1/3
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFI--ETC(U)
SEP 78 P F SHERIDAN DAAJ02-77-C-0020
UNCLASSIFIED USARTL-TR-78-23G NL

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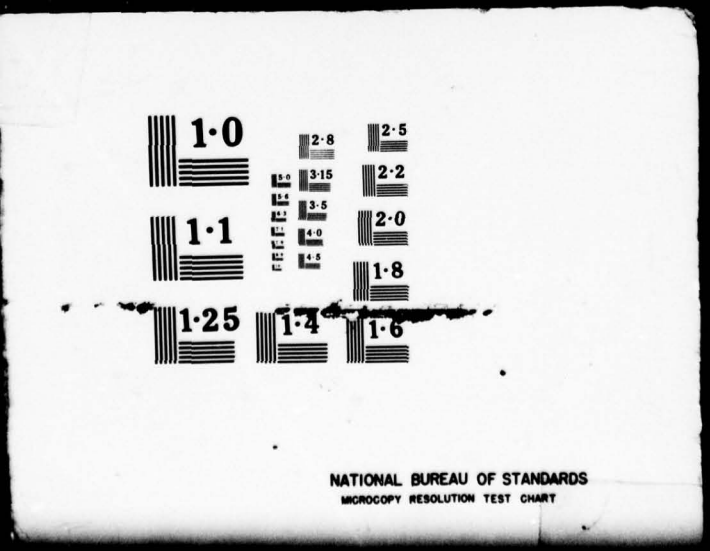

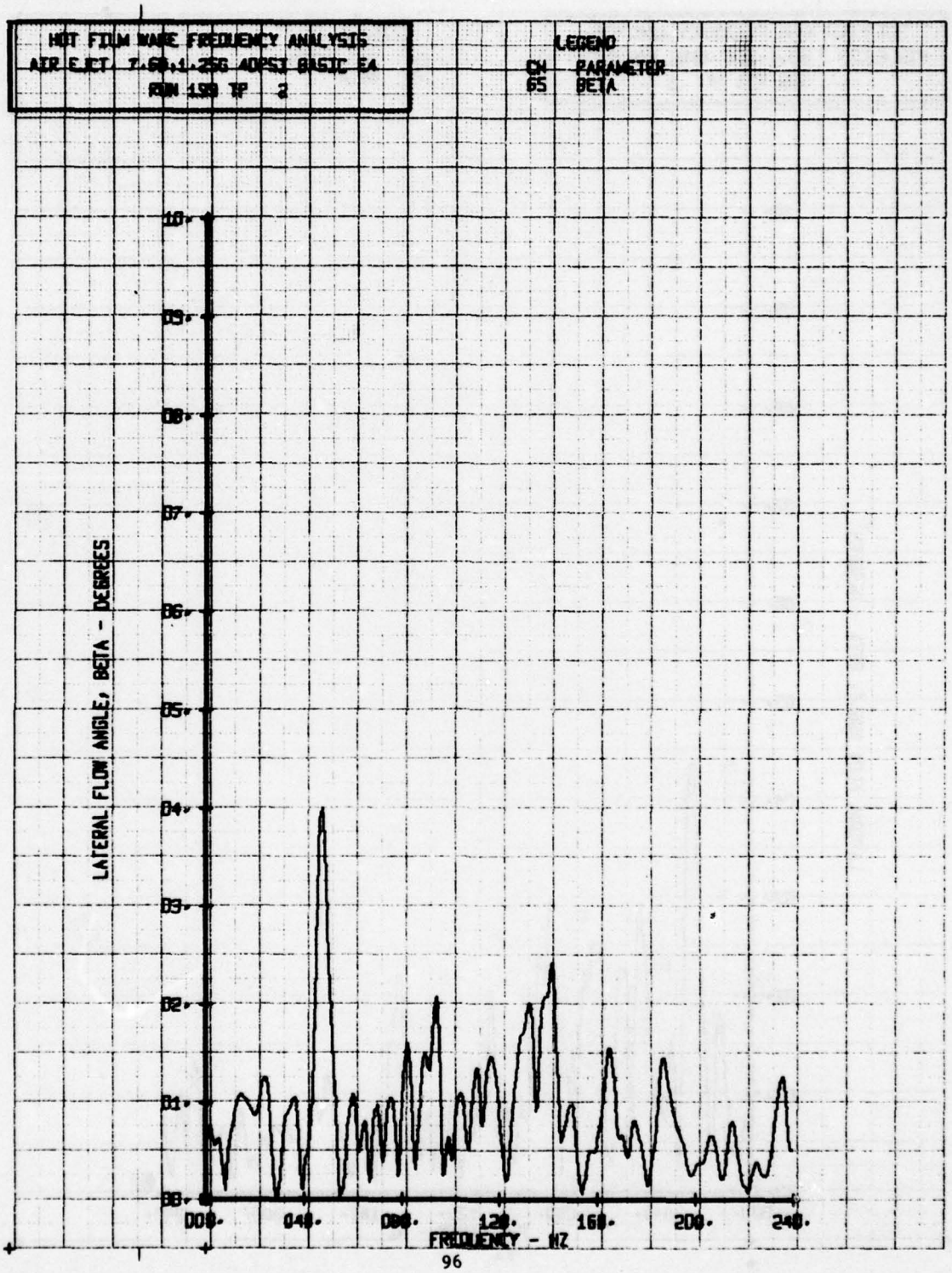
HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.5G,1.25G 40PSI BASIC EA
RUN 150 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
10.
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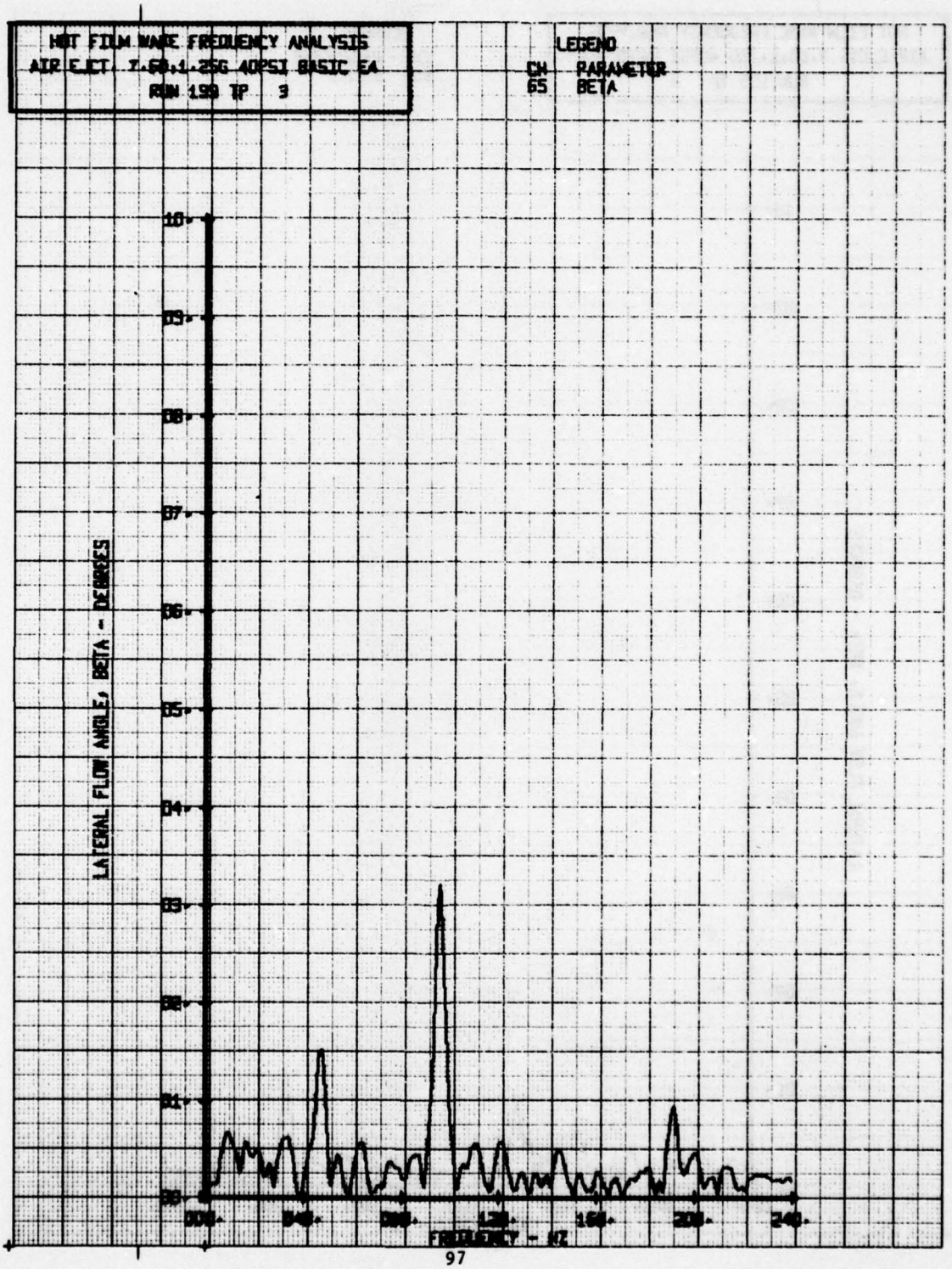
FREQUENCY - HZ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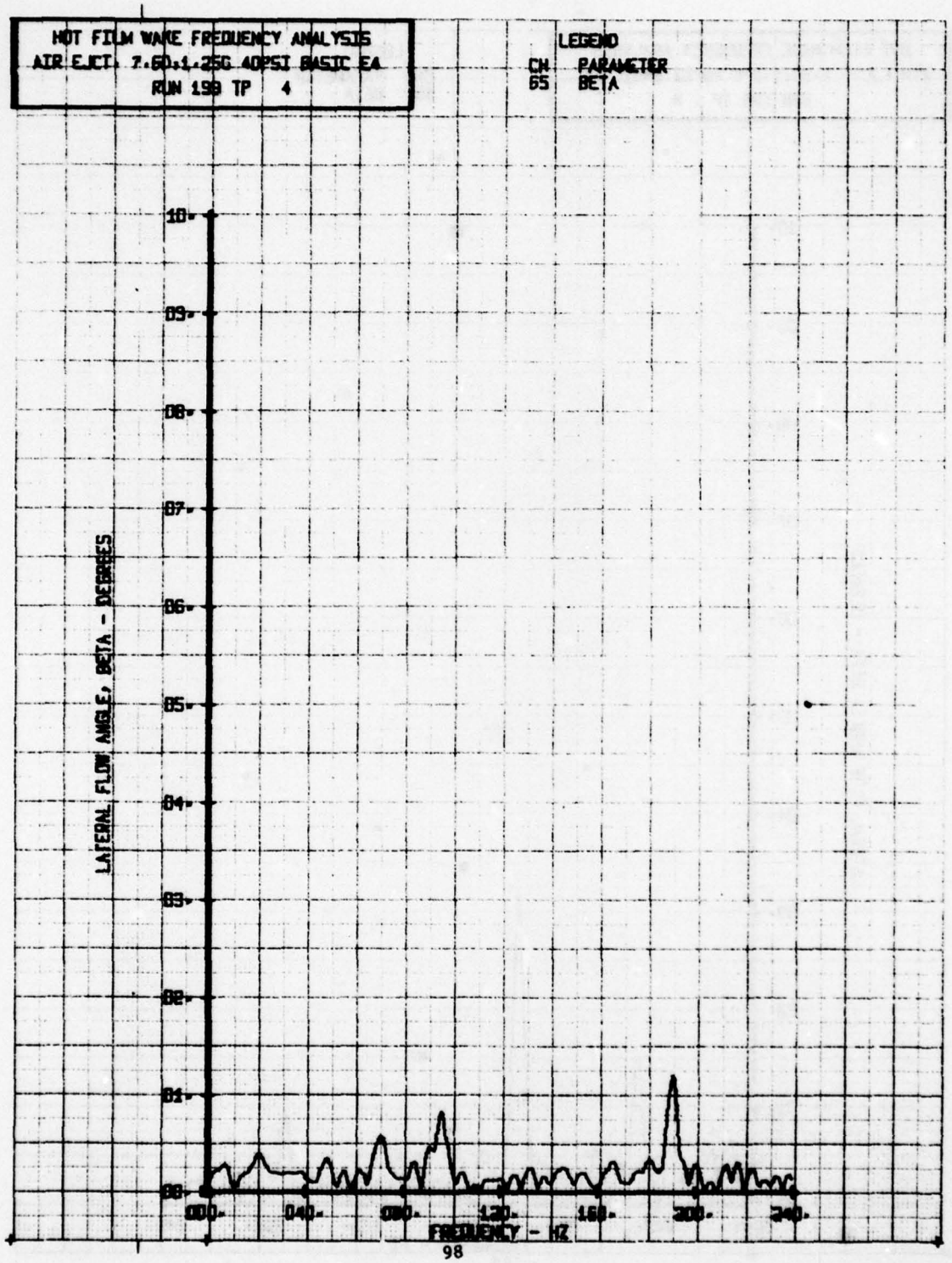
AIR EJCT. 7.6@.1.25G 40PSI BASIC E4
RUN 190 TP 3
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. 7.60.1.25G 40PSI BASIC EA
RUN 199 TP 4
LEGEND
CH PARAMETER
65 BETA
10
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LATERAL FLOW ANGLE, BETA - DEGREES
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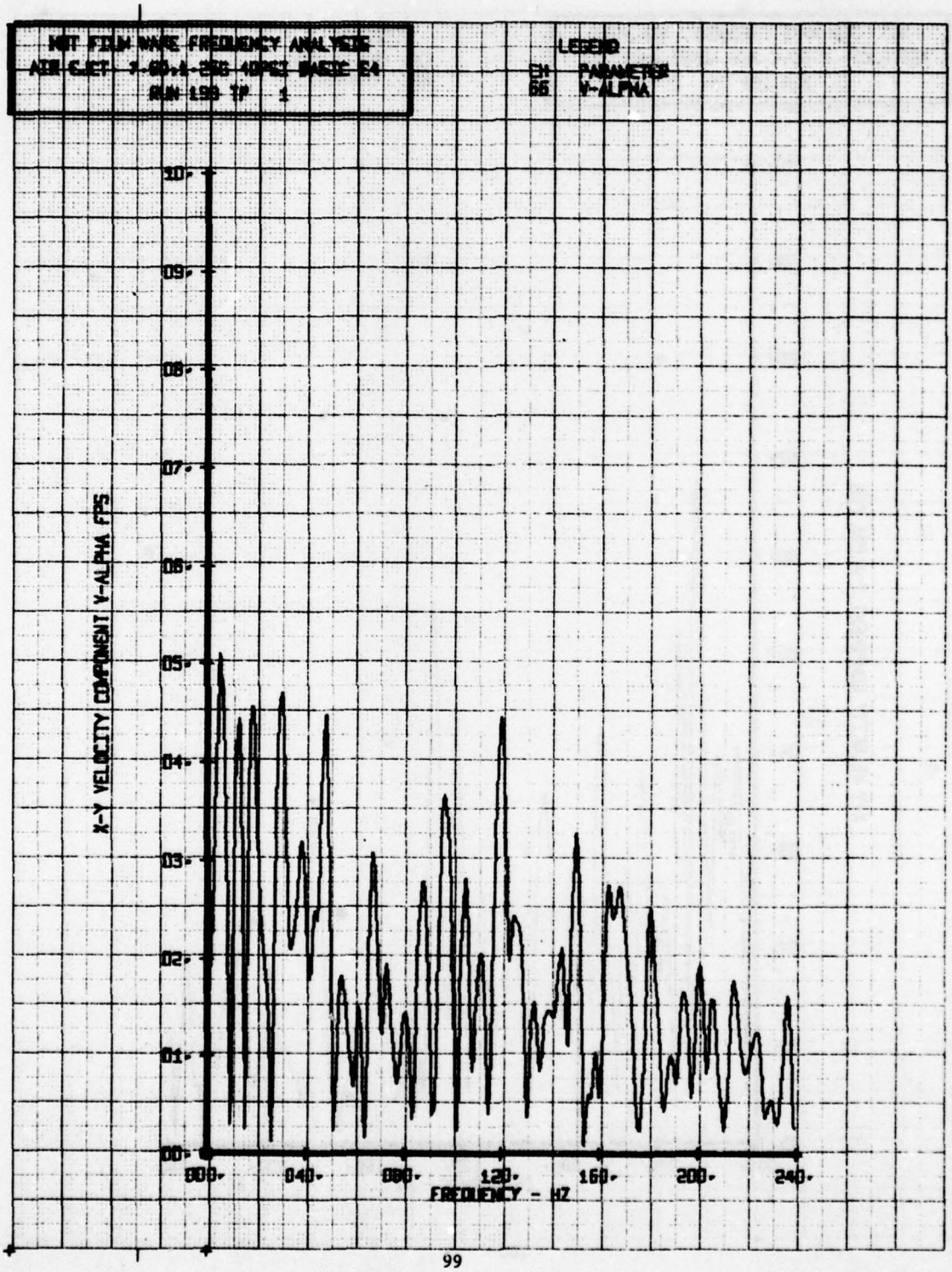
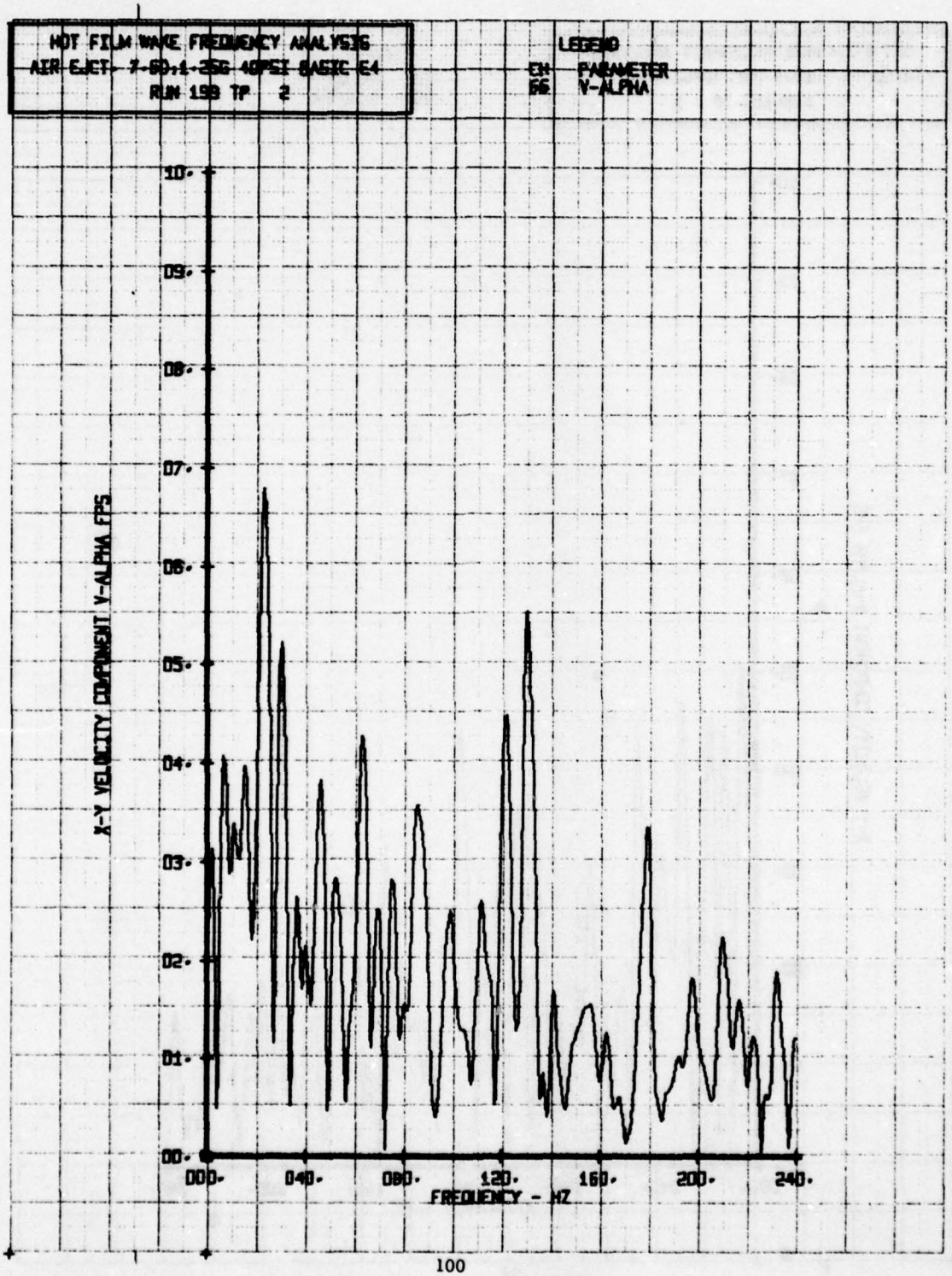
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR-EJECT 7-60-4-25G 40PSI BASIC E4
RUN 159 TP 1
LEGEND
E1 PARAMETER
86 V-ALPHA
X-Y VELOCITY COMPONENT V-ALPHA FPS
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJET- 7-60,1-25G 40PSI BASIC E4
RUN 153 TP 2
LEGEND
CH PARAMETER
06 V-ALPHA
X-Y VELOCITY COMPONENT V-ALPHA FPS
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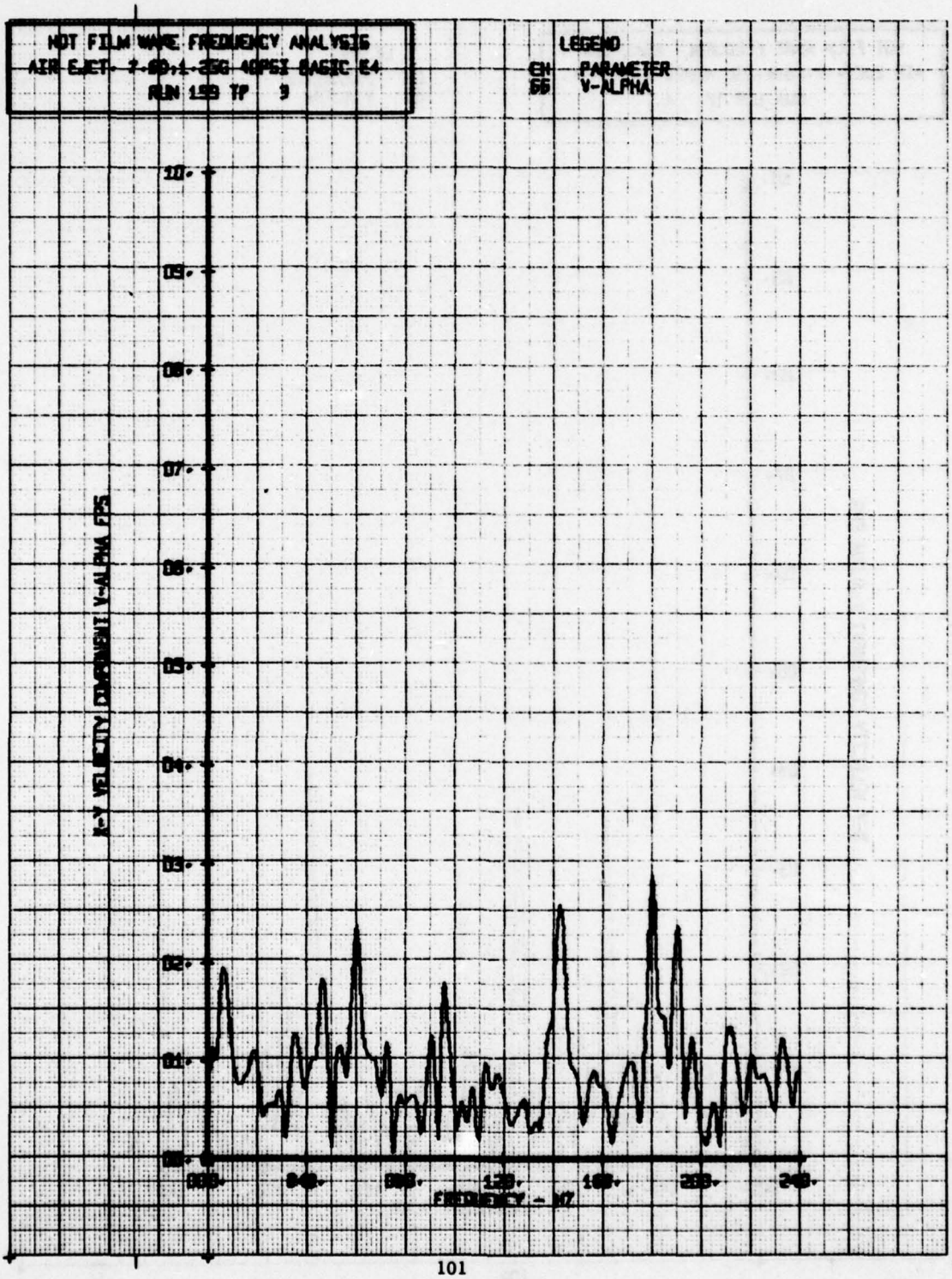
FREQUENCY - HZ


HOT FILM WAVE FREQUENCY ANALYSIS
AIR EJECT- 7-60,1-250 40PSI BASIC E4
RUN 159 TP 9
LEGEND
CH PARAMETER
56 V-ALPHA
.11-
.09-
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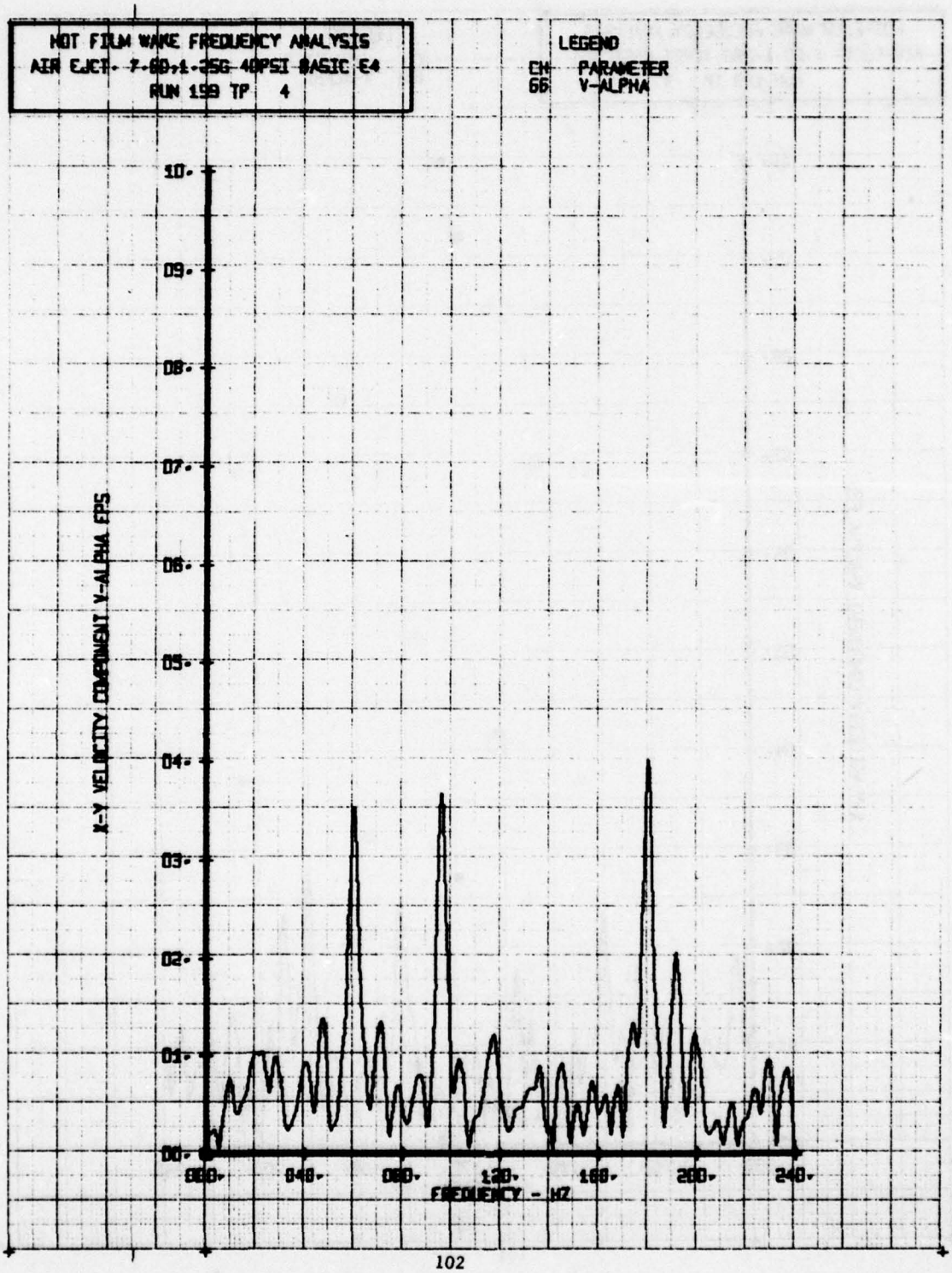
X-V VELOCITY FLUCTUATIONS V-ALPHA FPS
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-80,1-25G 40PSI BASIC E4
RUN 199 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
X-Y VELOCITY COMPONENT V-ALPHA FPS
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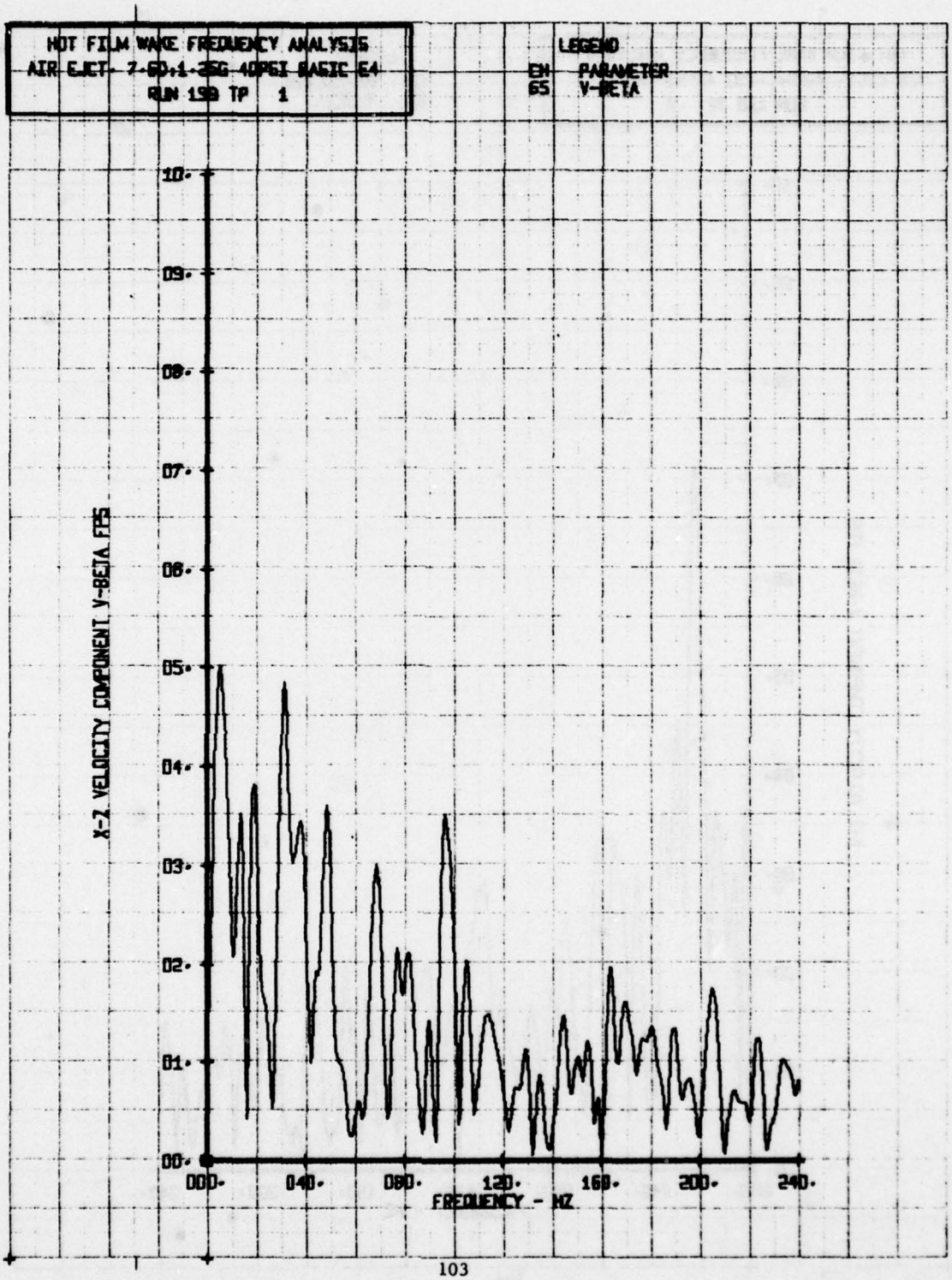
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-60-1-35G-40PSI BASIC E4
RUN 198 TP 1
LEGEND
EN PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FPS
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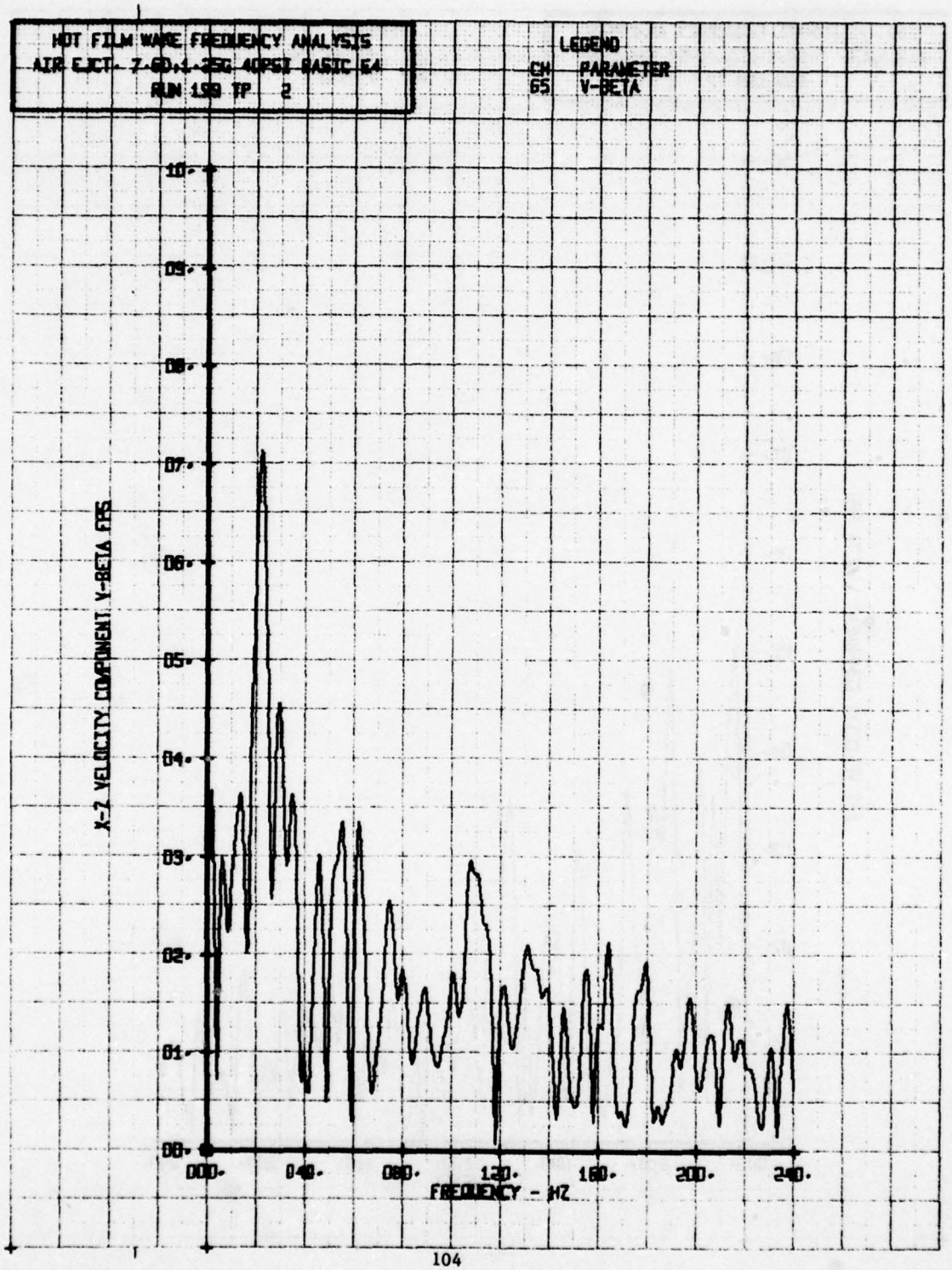
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7.6D,1.25G 40PSI BASIC 64
RUN 199 TP 2
LEGEND
CH PARAMETER
65 V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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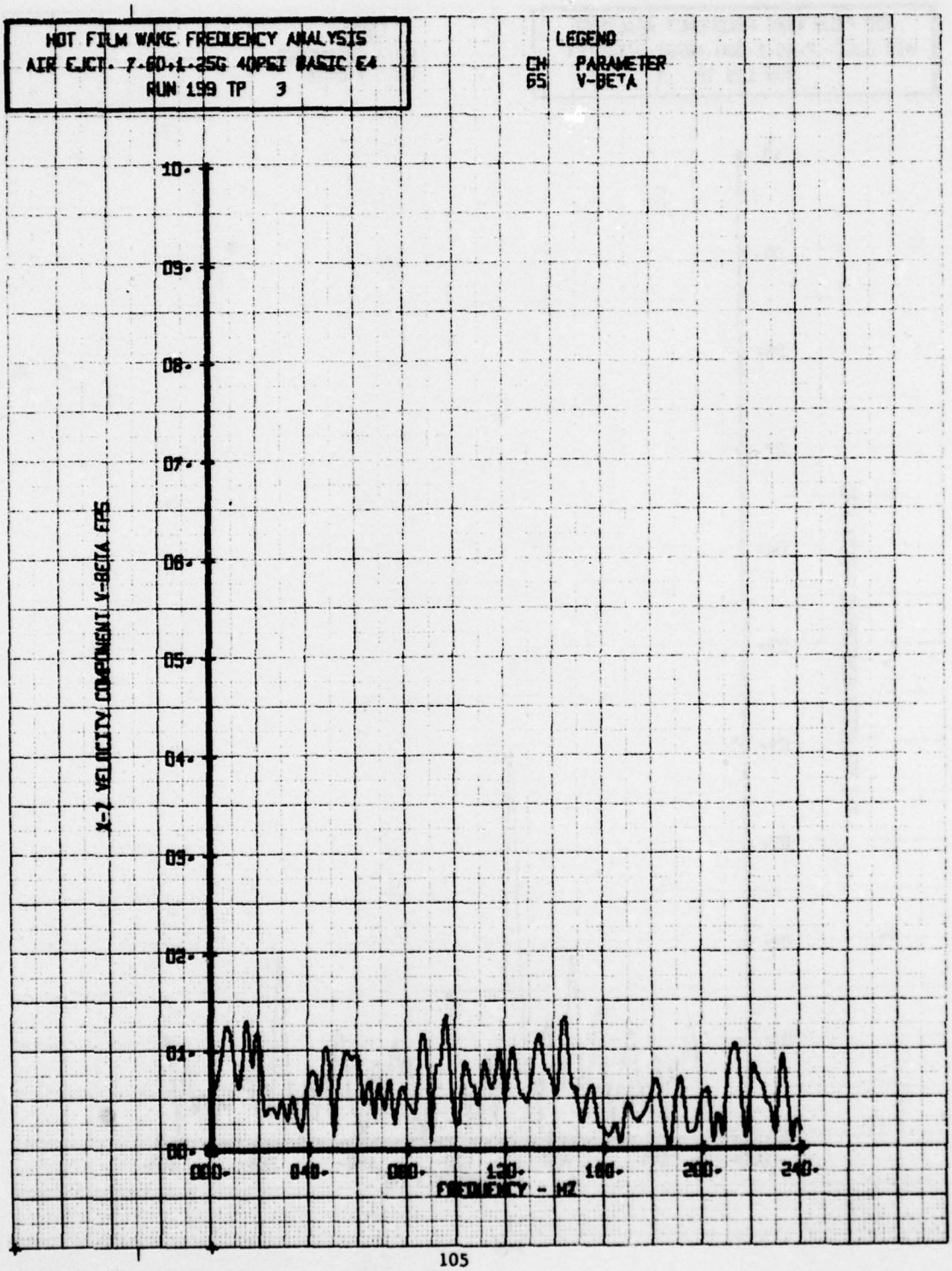
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT- 7-60-1-25G 40PSI BASIC E4
RUN 199 TP 3
LEGEND
CH PARAMETER
65 V-BETA
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X-Z VELOCITY COMPONENT V-BETA FPS
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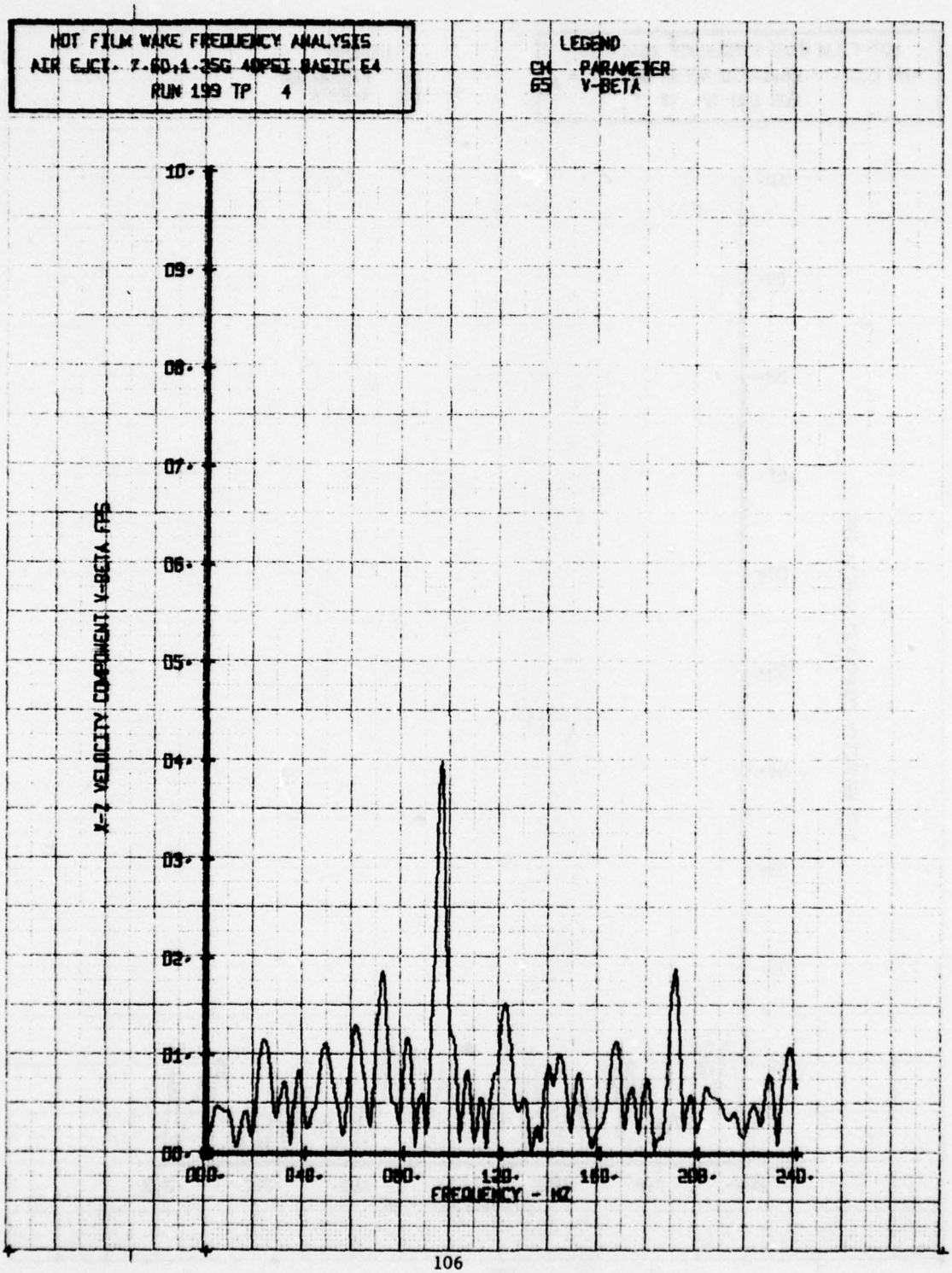
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJCT. Z-60.1-35G 40PSI BASIC E4
RUN 199 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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X-Z VELOCITY COMPONENT V-BETA FPS
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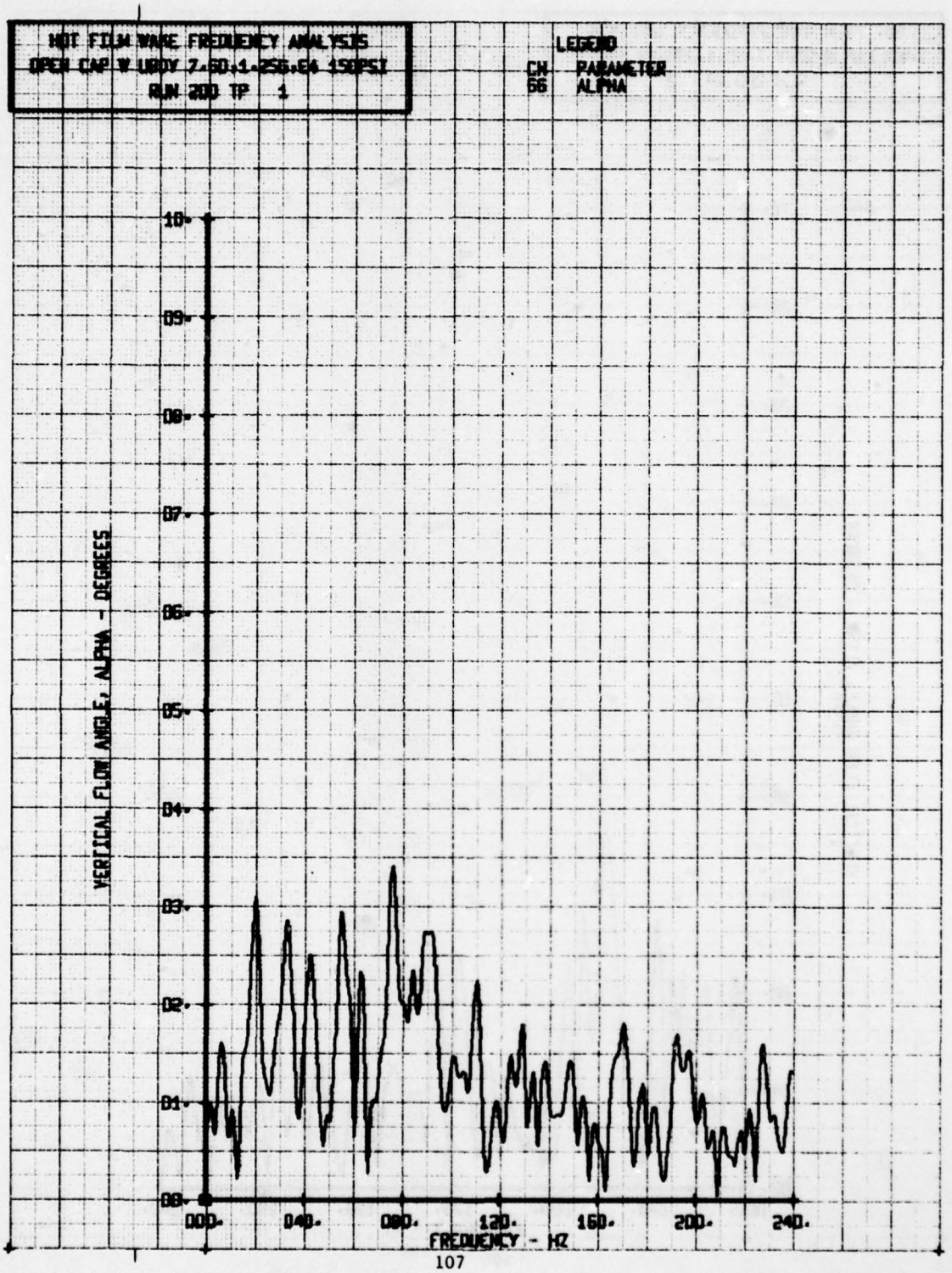
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UROV 7.50.1.256.64 150PSI
RUN 200 TP 1
LEGEND
CH PARAMETER
66 ALPHA
10.
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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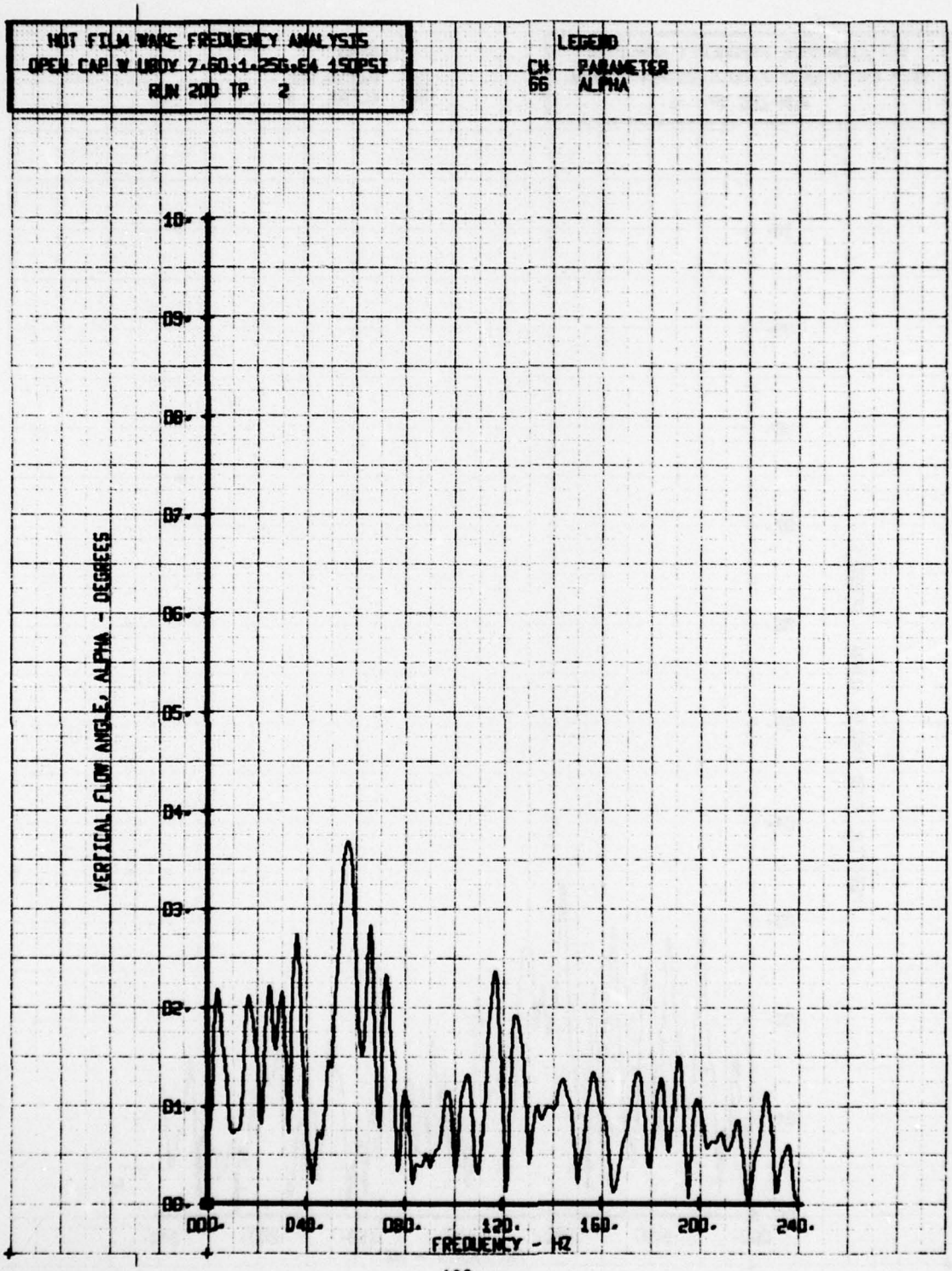
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60+1.25E+04 150PSI
RUN 200 TP 2
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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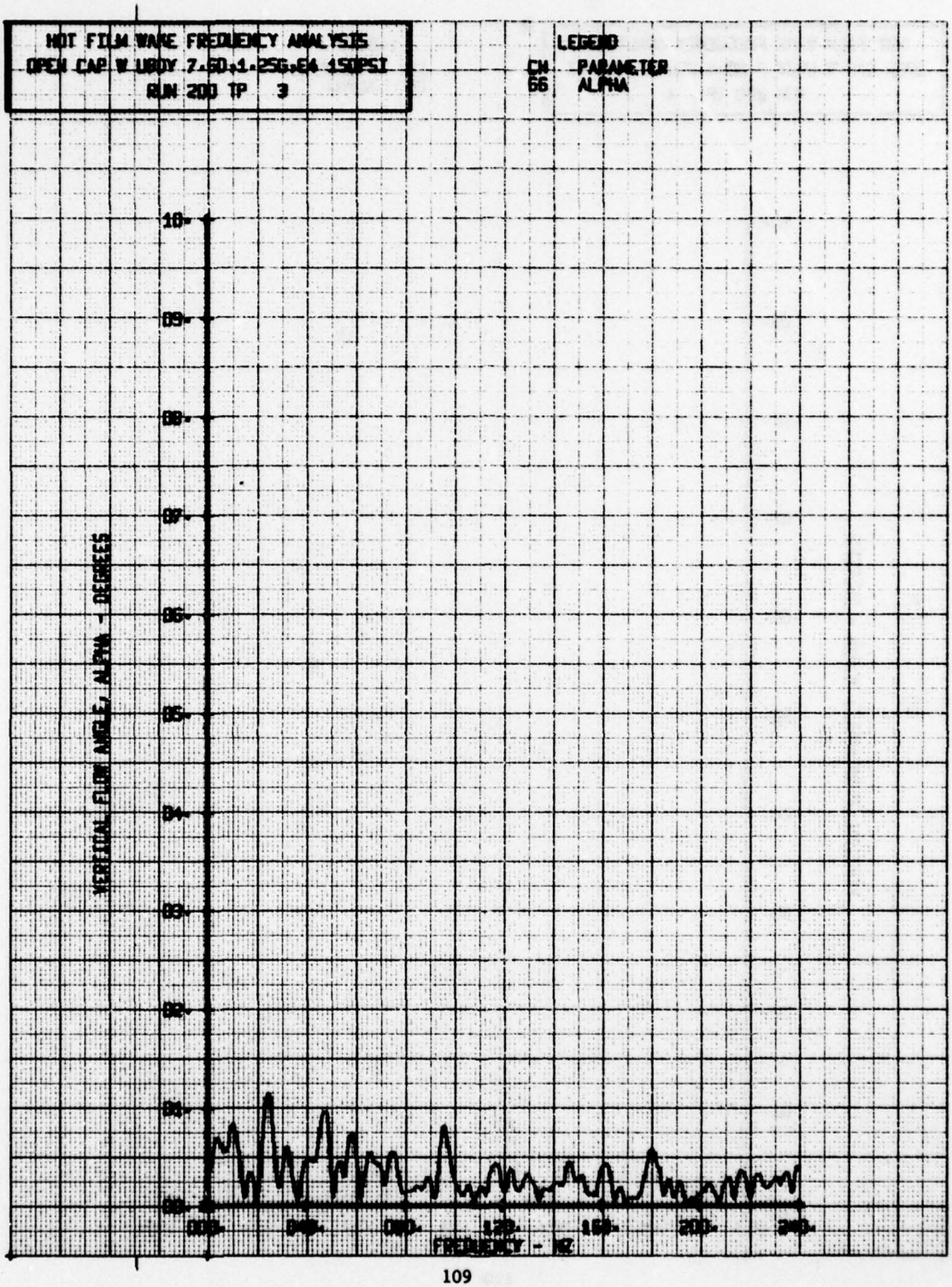
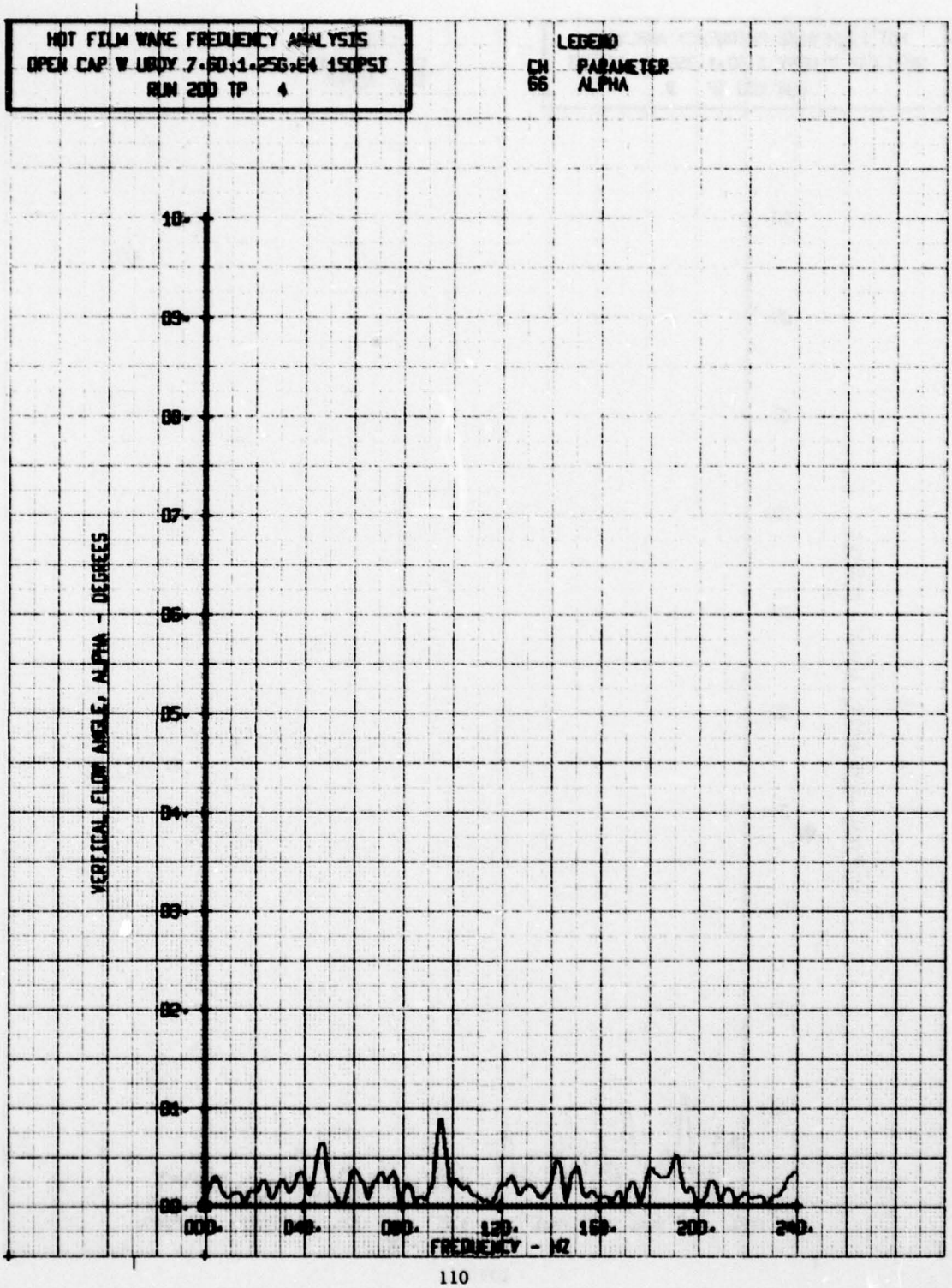
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60+1.25G+64 150PSI
RUN 200 TP 3
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60+1.25G.E4 150PSI
RUN 200 TP 4
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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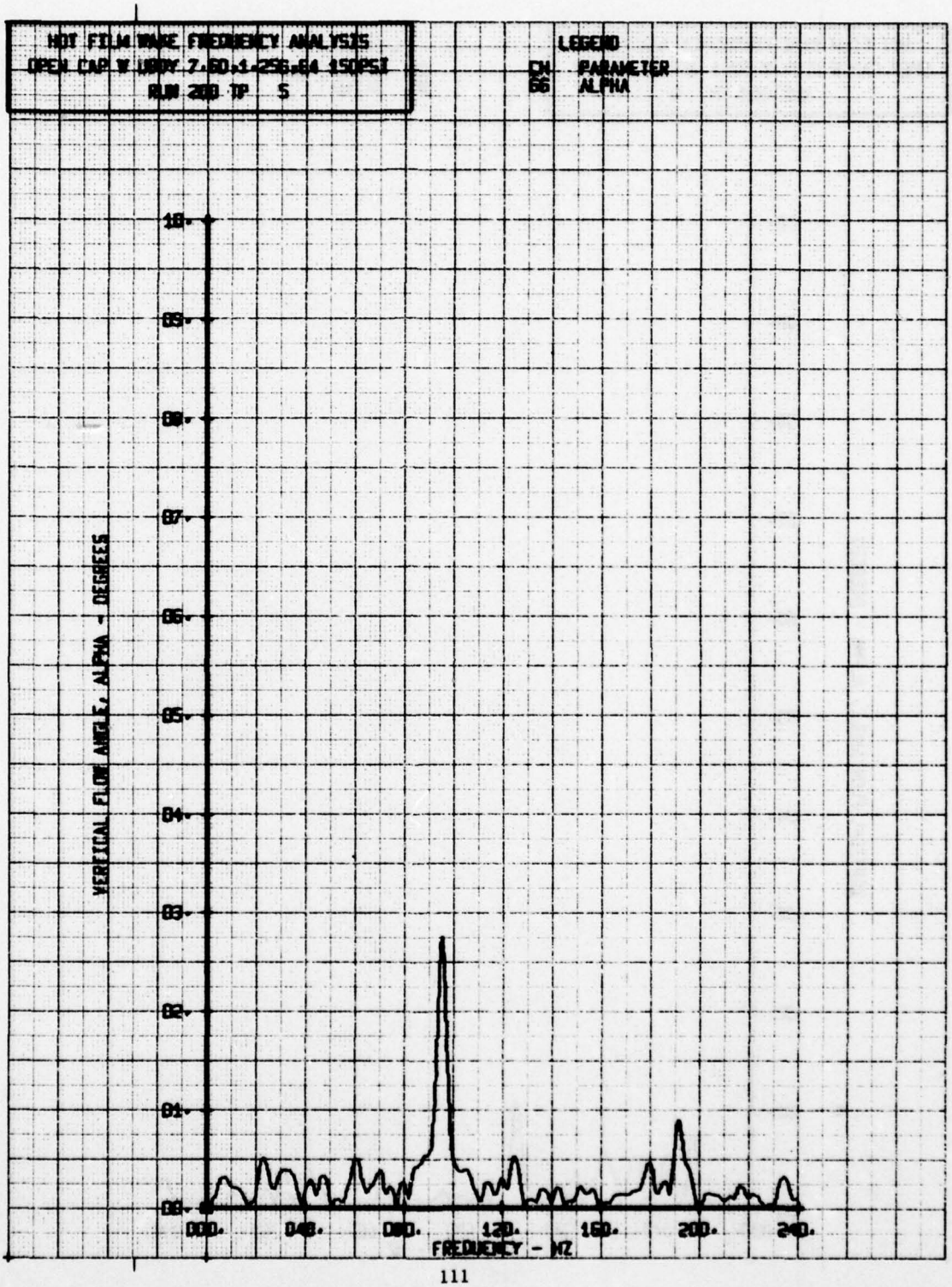
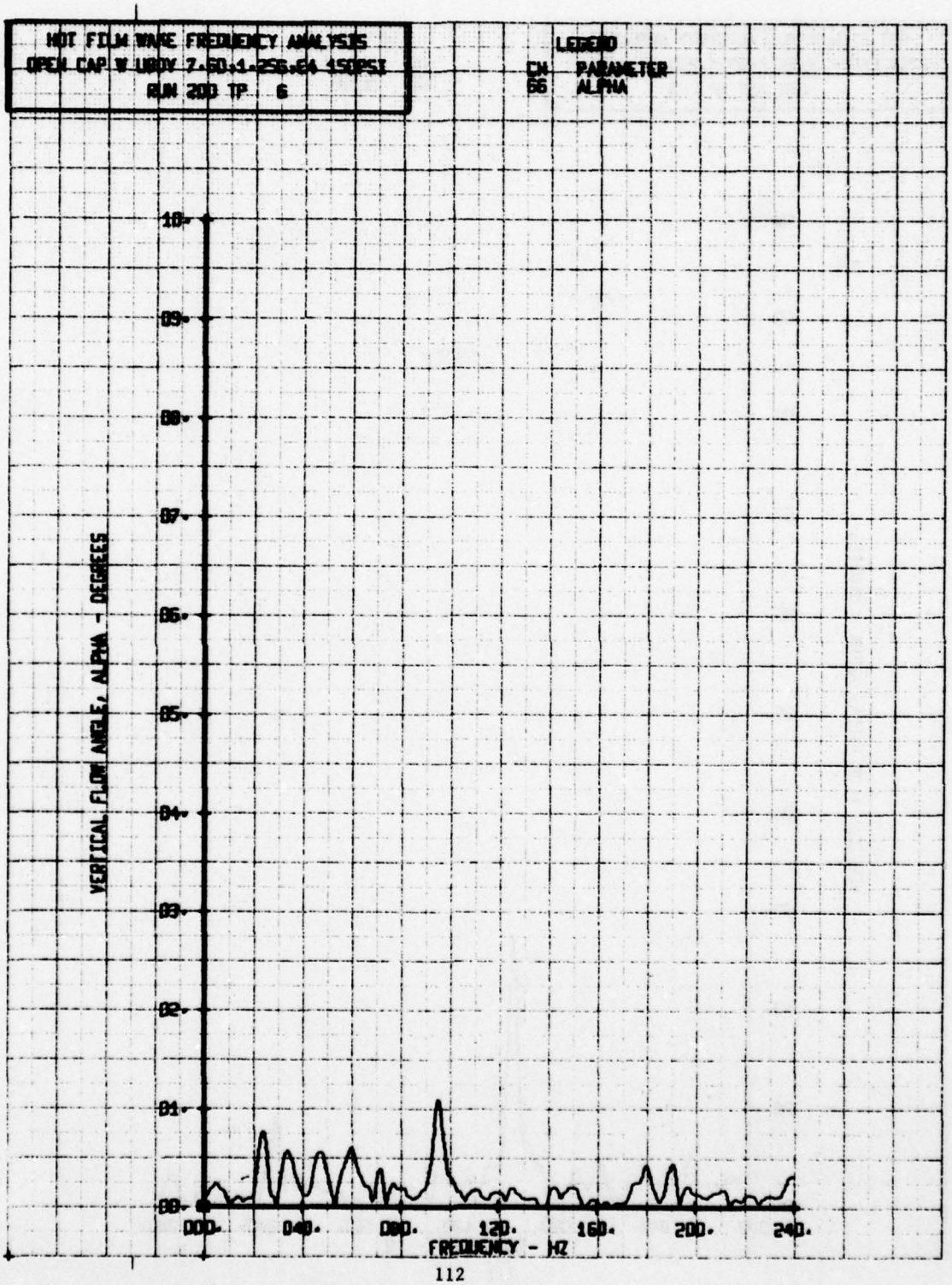
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W BODY 7.60-1-256-64 150PSI
RUN 200 TP 5
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.50:1-256.6A 150PSI
RUN 200 TP 6
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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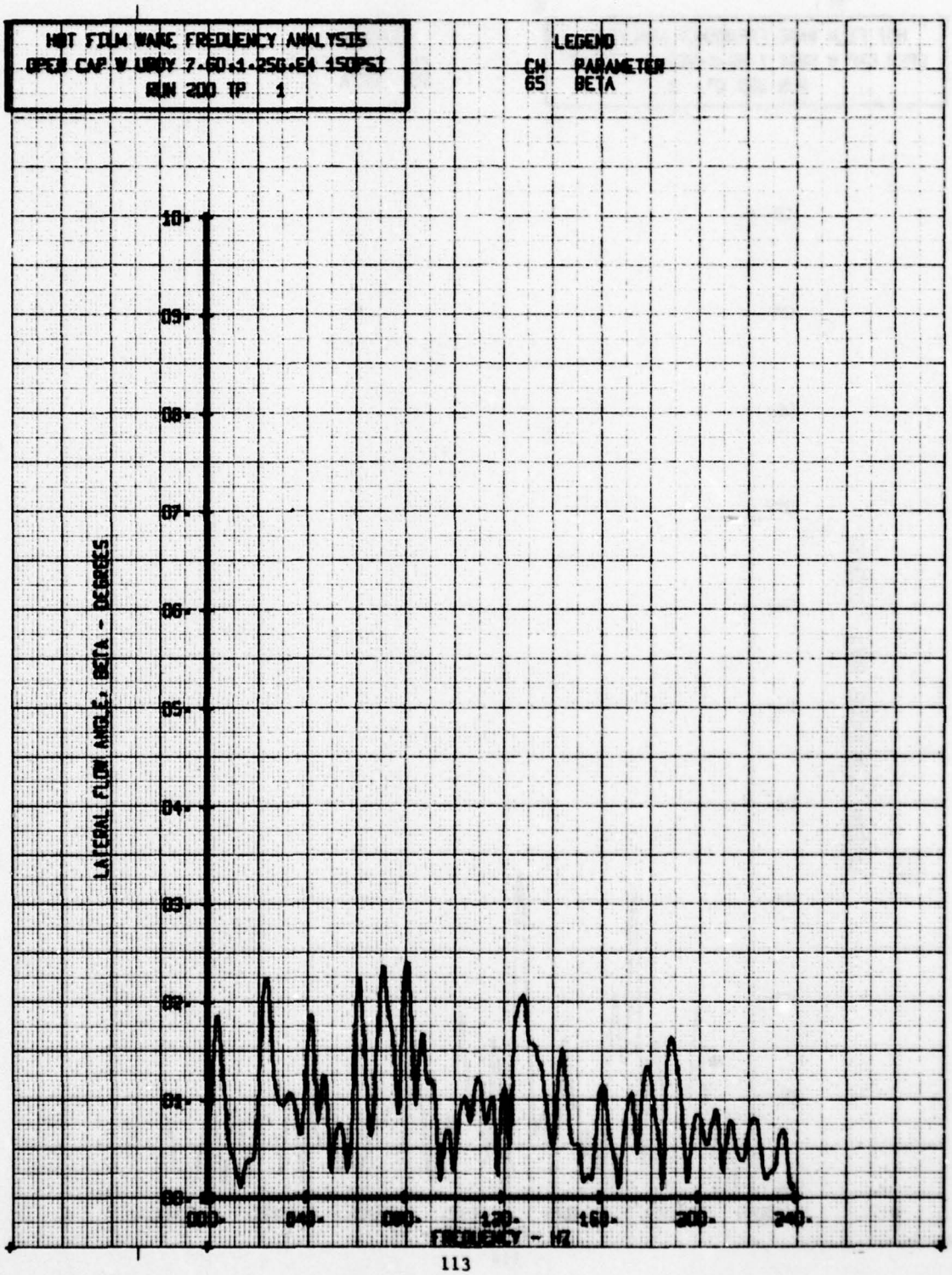
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UROV 7.60.1.256.64 150PSI
RUN 200 TP 1
LEGEND
CH PARAMETER
65 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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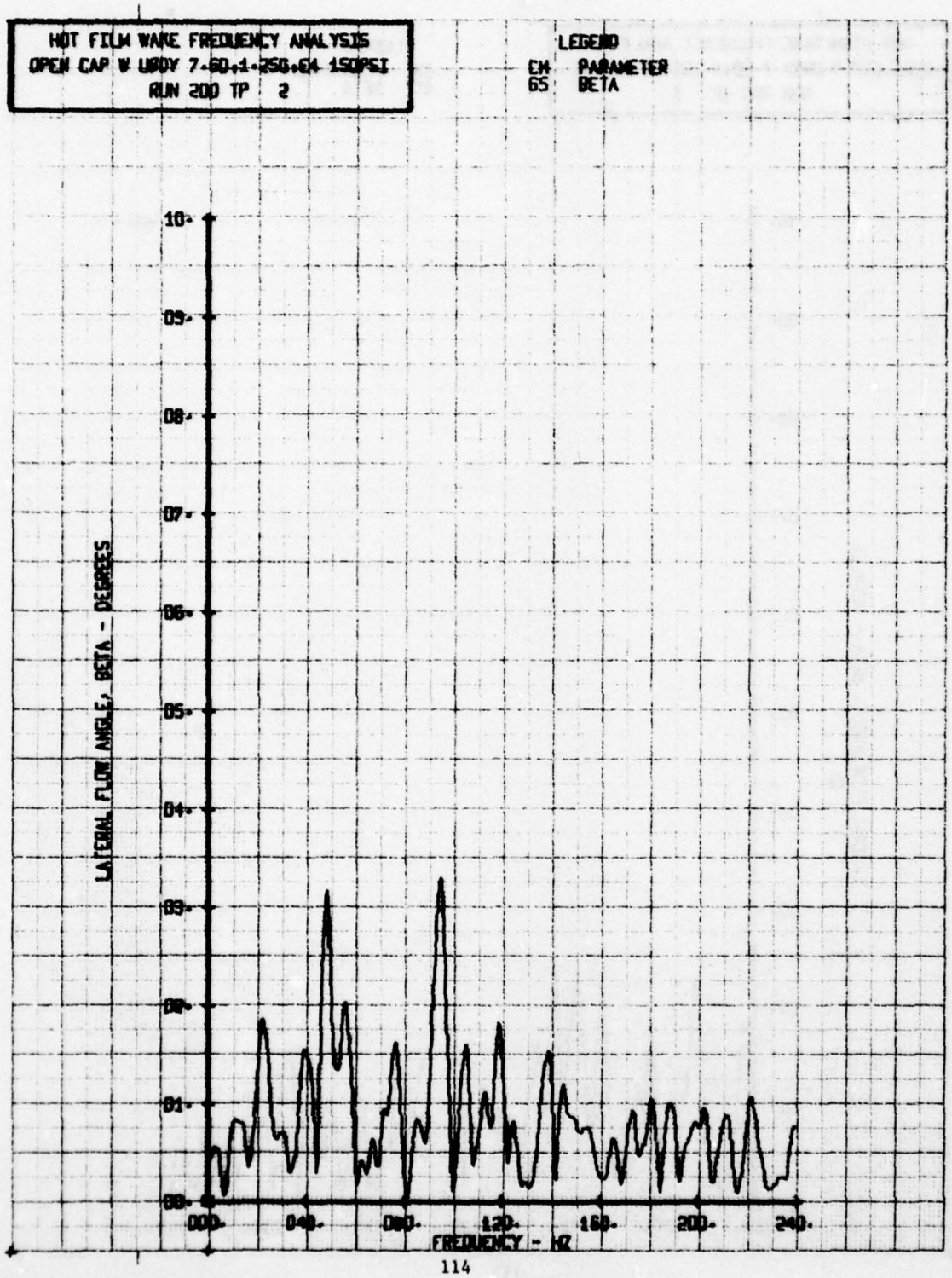
240
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60,1.250,64 150PSI
RUN 200 TP 2
LEGEND
CM PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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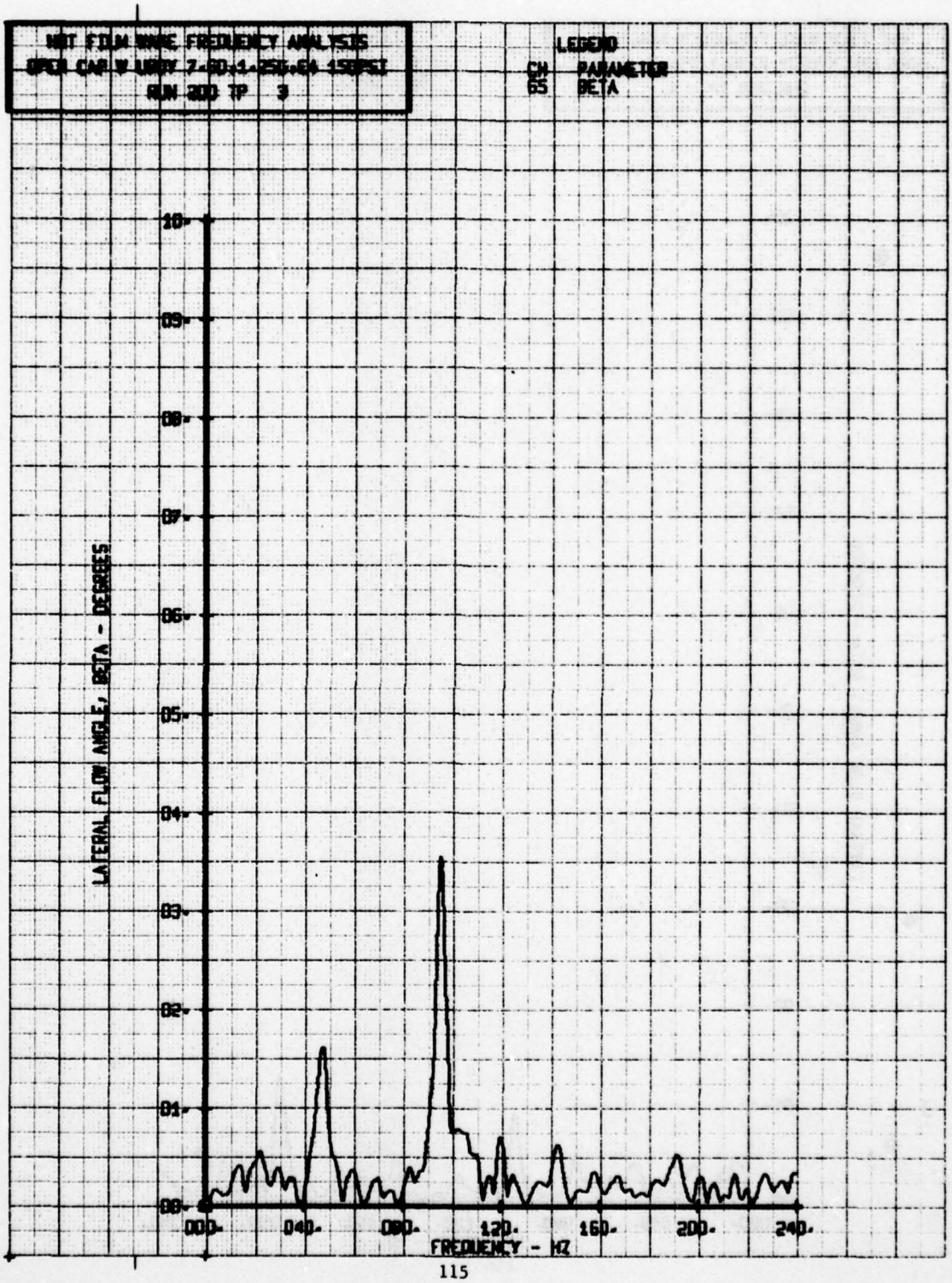
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
UPPER CAP W UBDY 7.00+1.250+.00 150PSI
RUN 200 TP 3
LEGEND
CH PARAMETER
05 BETA
10.
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LATERAL FLOW ANGLE, BETA - DEGREES
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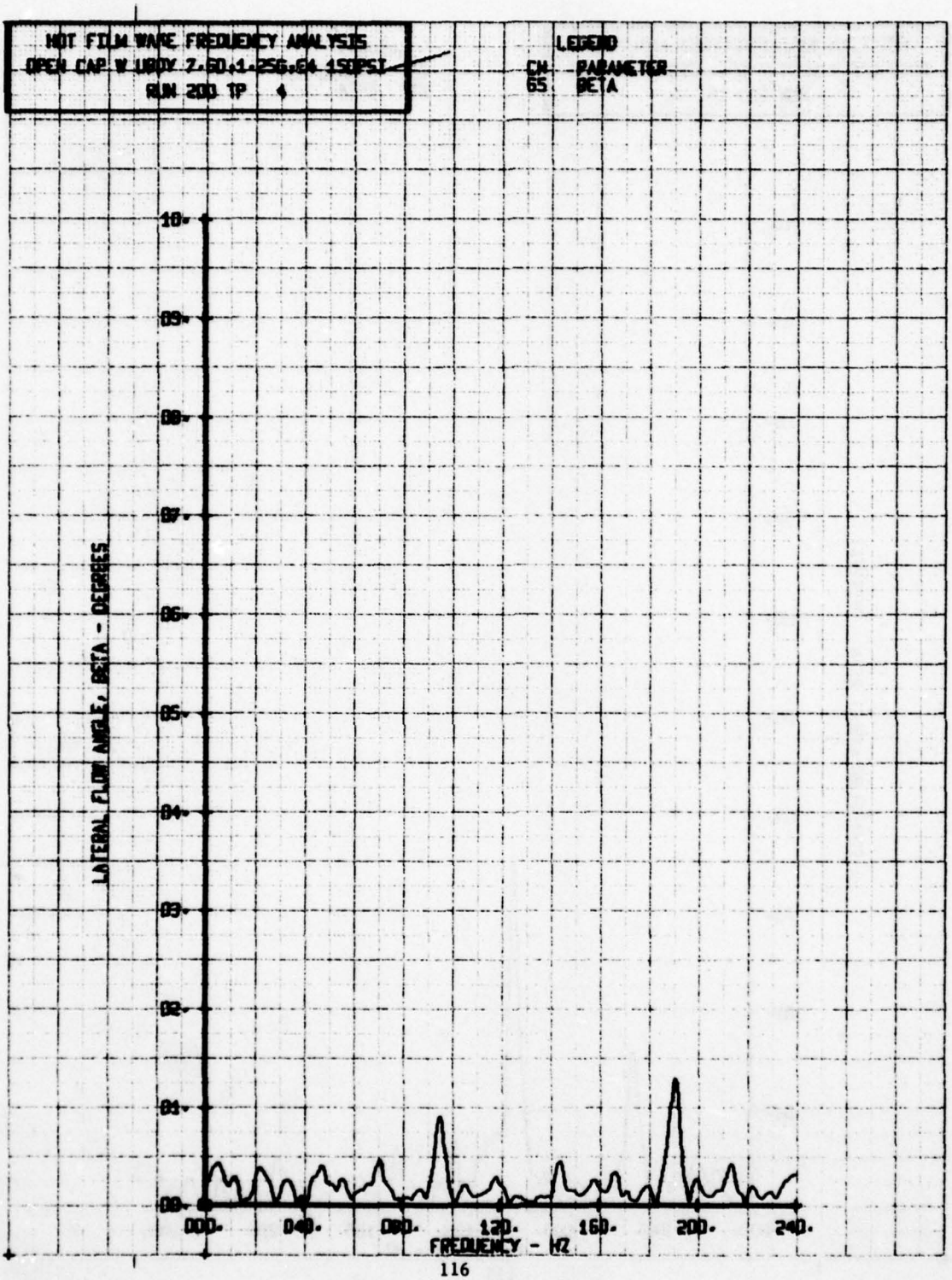
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 2.50,1.25G,64 150PSI
RUN 200 TP 4
LEGEND
CH. PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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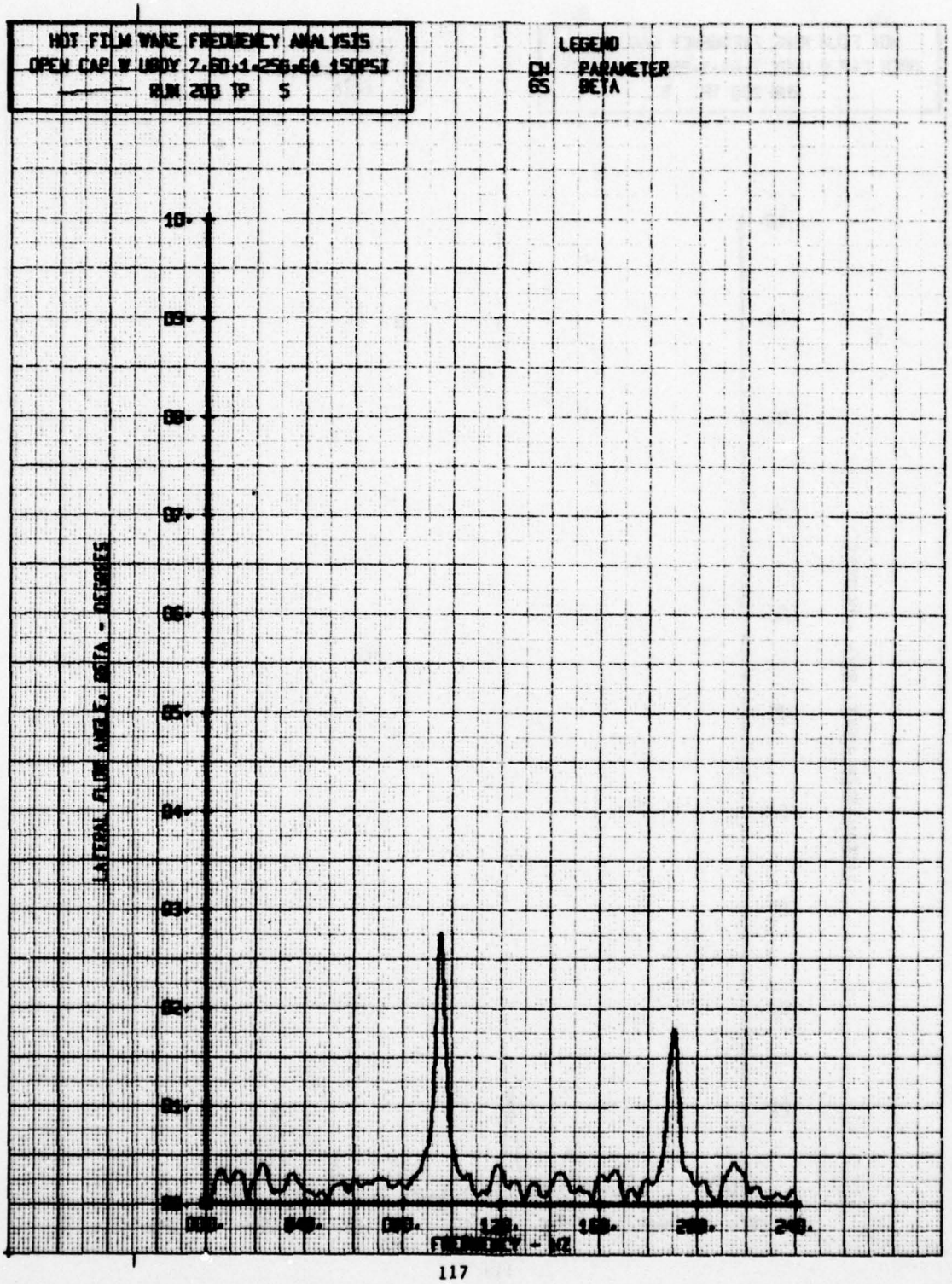
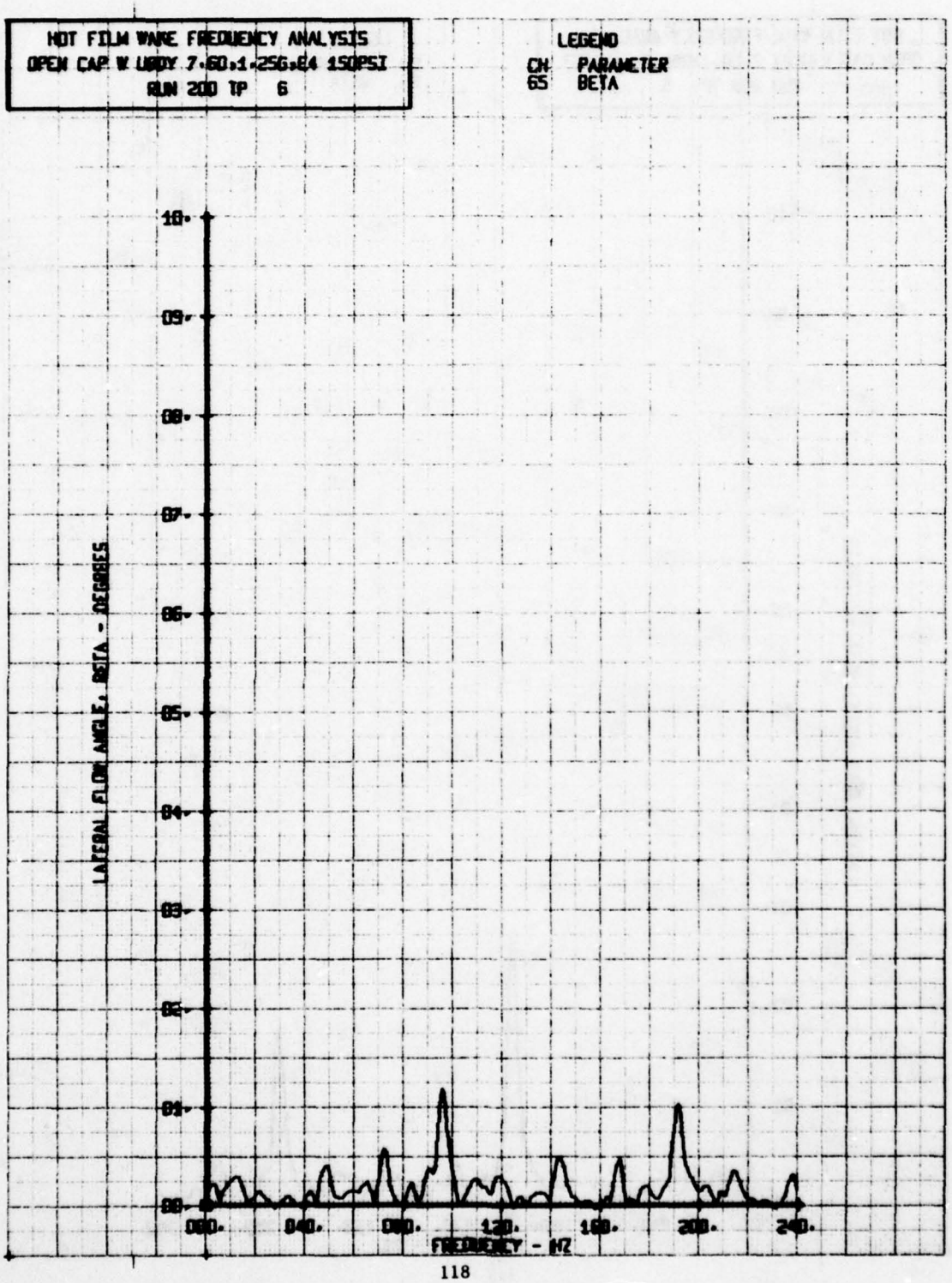
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60.1-256.64 150PSI
RUN 203 TP 5
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W BODY 7.60:1.256:E4 150PSI
RUN 200 TP 6
LEGEND
CH PARAMETER
65 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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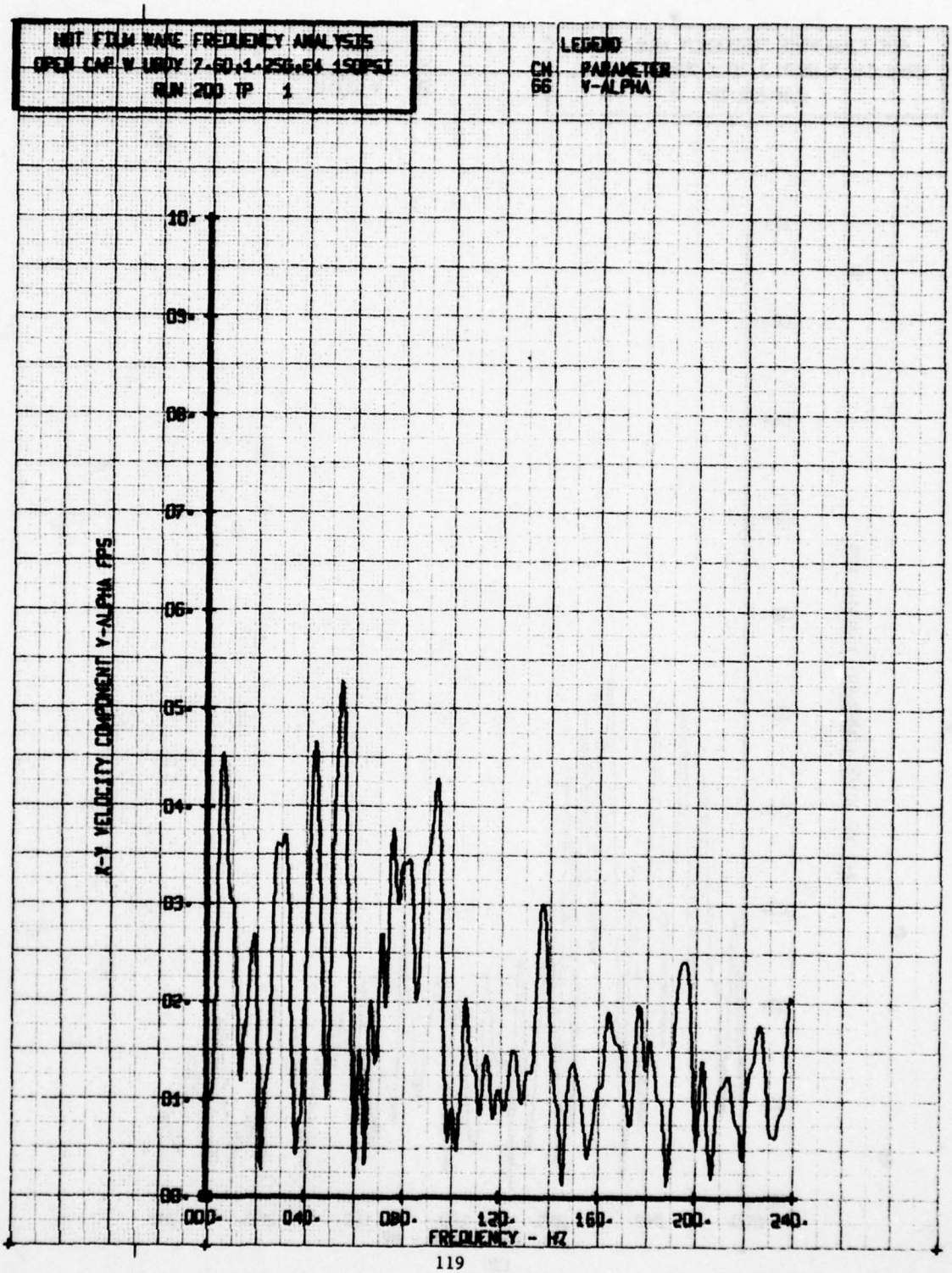
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W URDY 7-60-1-250-64 150PSI
RUN 200 TP 1
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT Y-ALPHA FPS
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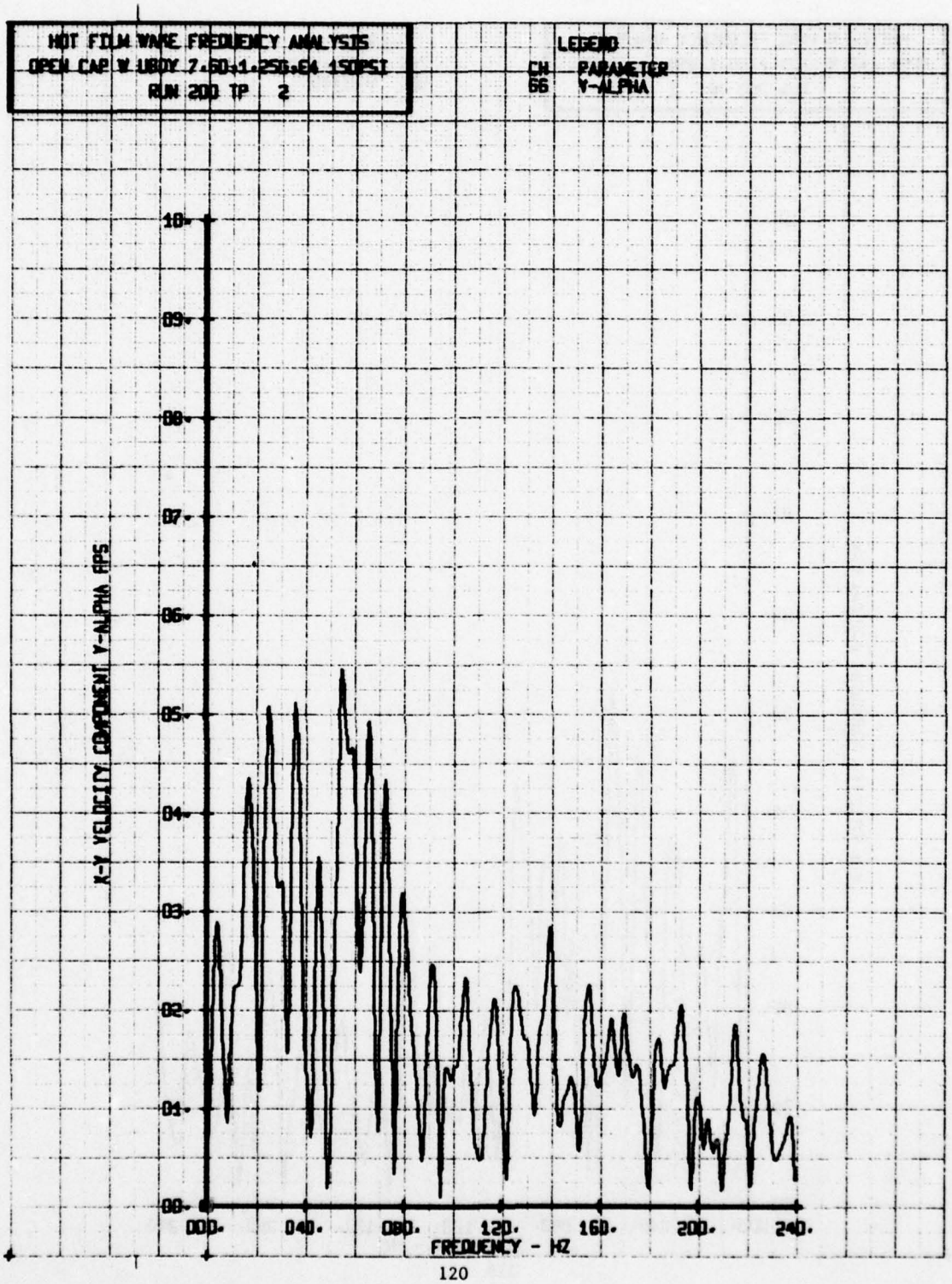
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60+1.25D.64 15DPSI
RUN 200 TP 2
LEGEND
CH PARAMETER
66 Y-ALPHA
X-Y VELOCITY COMPONENT Y-ALPHA_RPS
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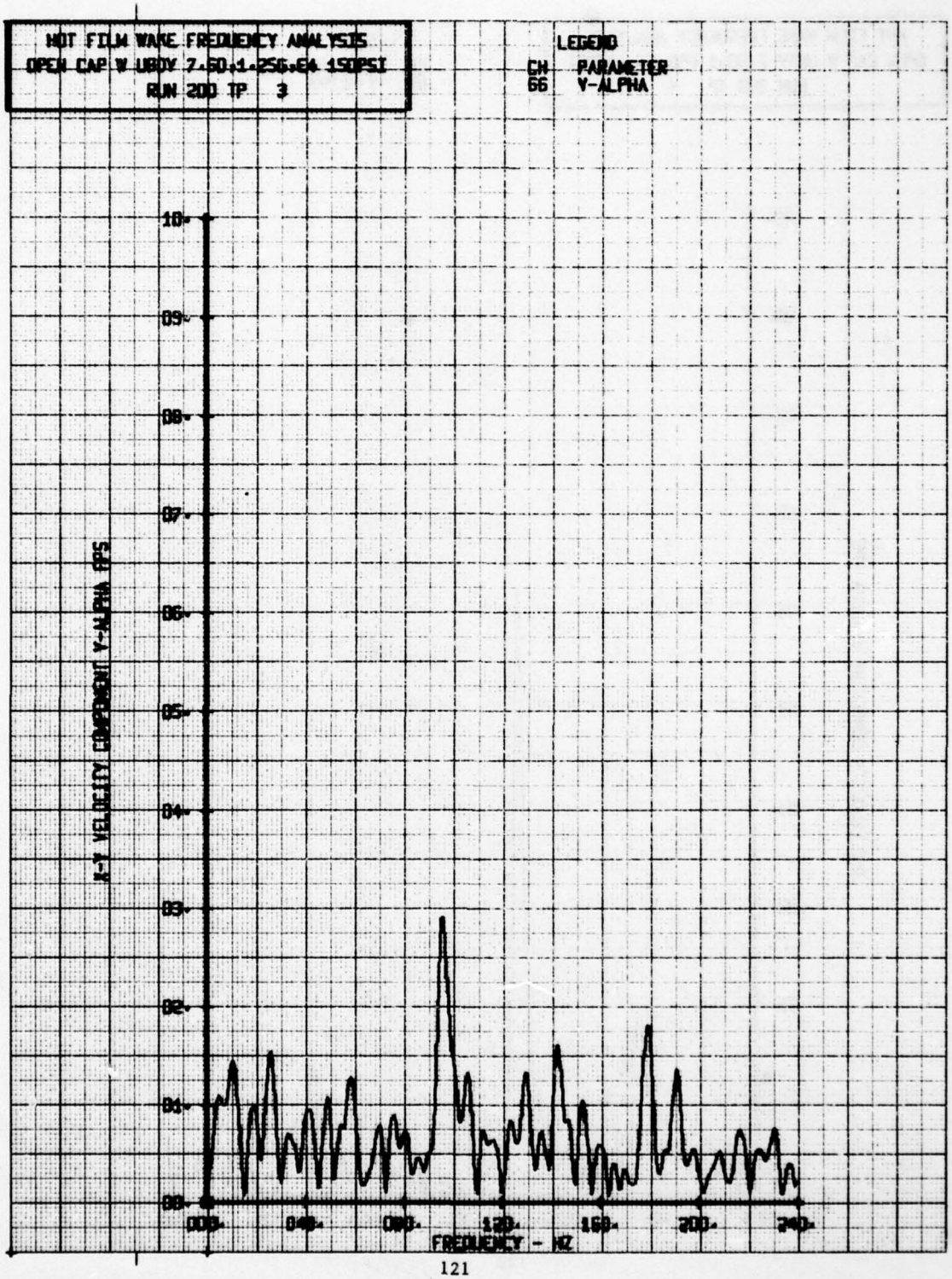
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.50+1.25E-04 150PSI
RUN 200 TP 3
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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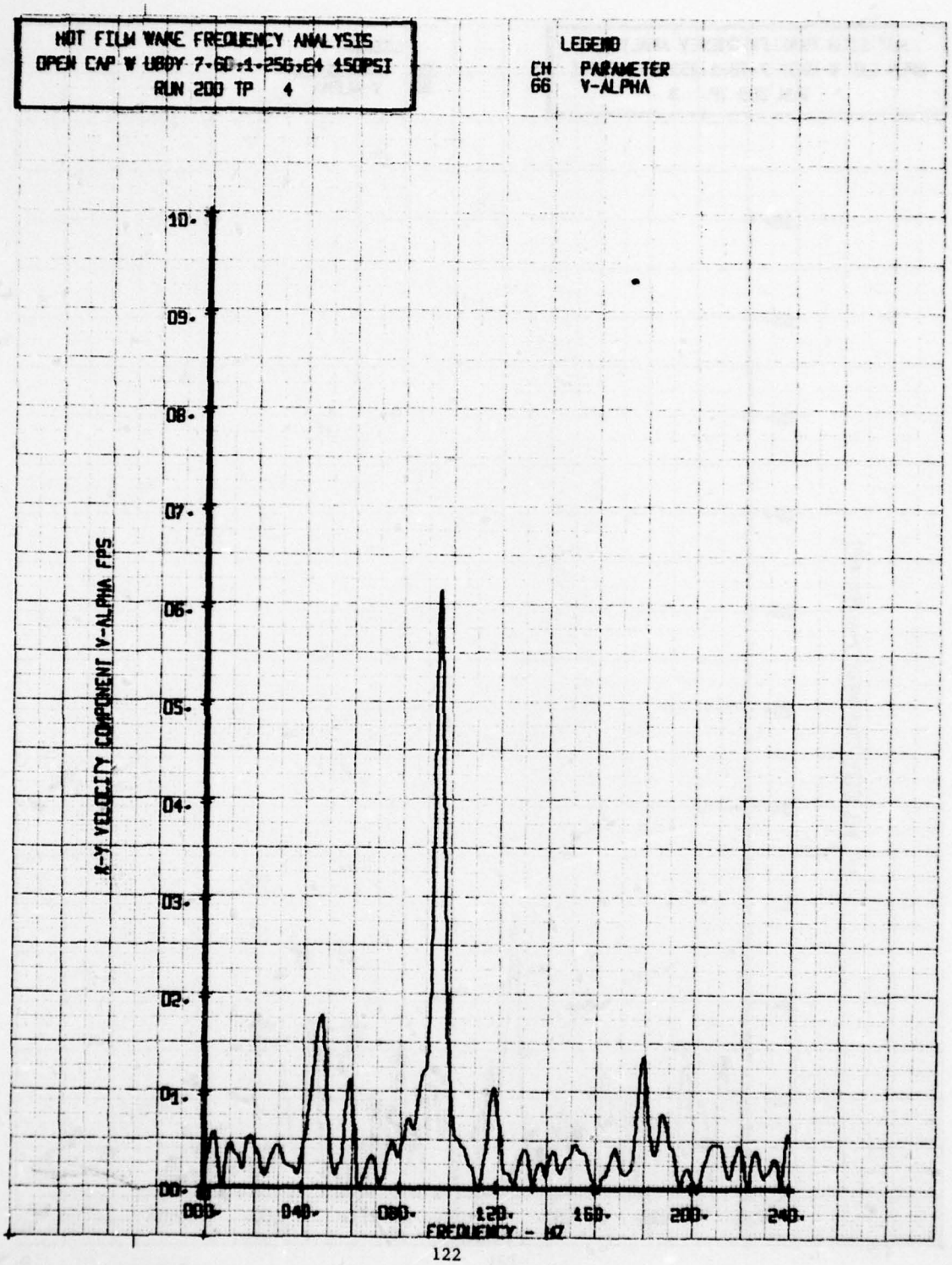
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7-60;1-256;E4 150PSI
RUN 200 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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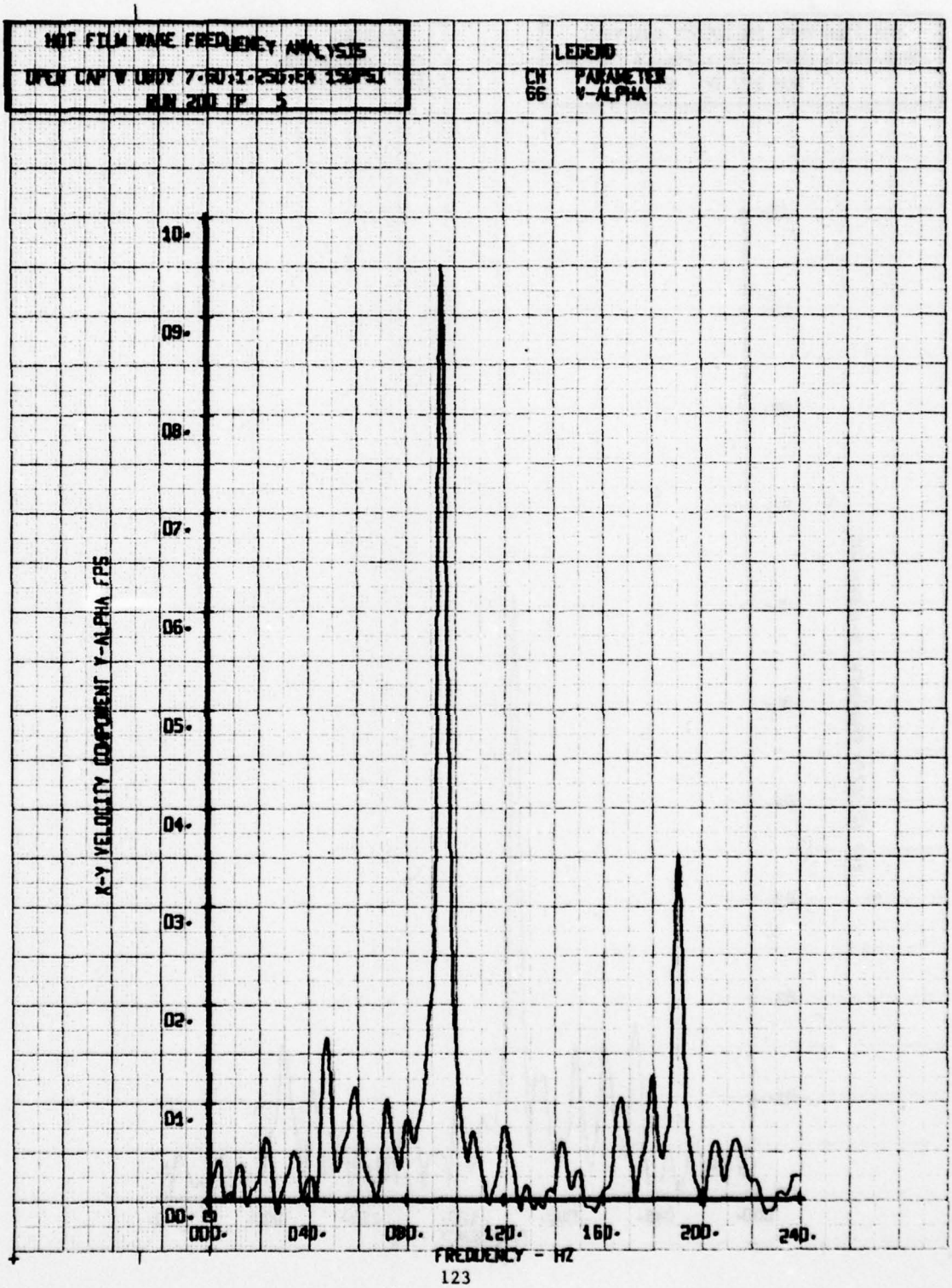
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDV 7.5U;1.25U;E4 15DPSI
RUN 200 TP 5
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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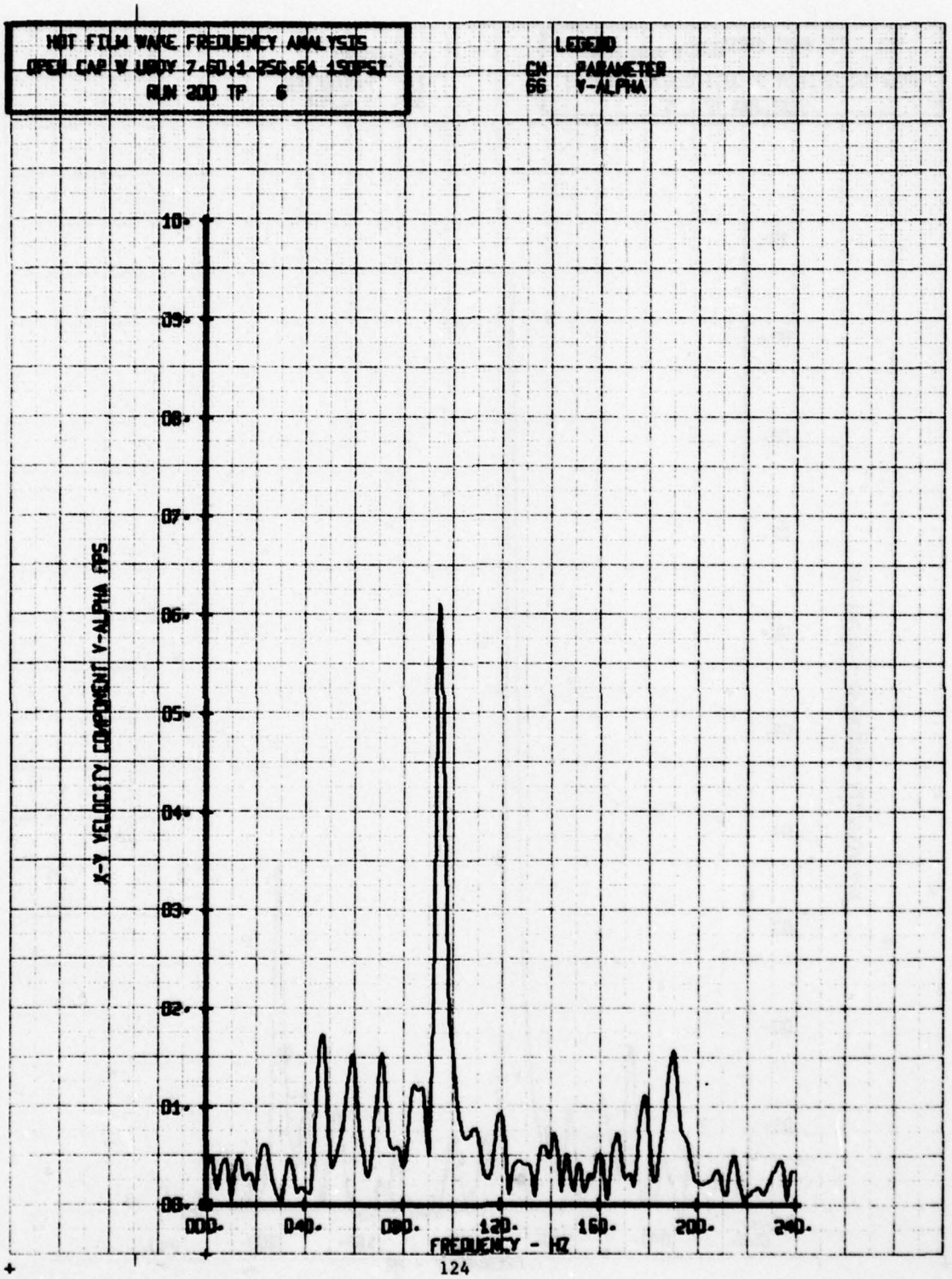
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7-60.1-256.64 150PSI
RUN 200 TP 6
LEGEND
CH PARAMETER
66 V-ALPHA
X-V VELOCITY COMPONENT V-ALPHA FPS
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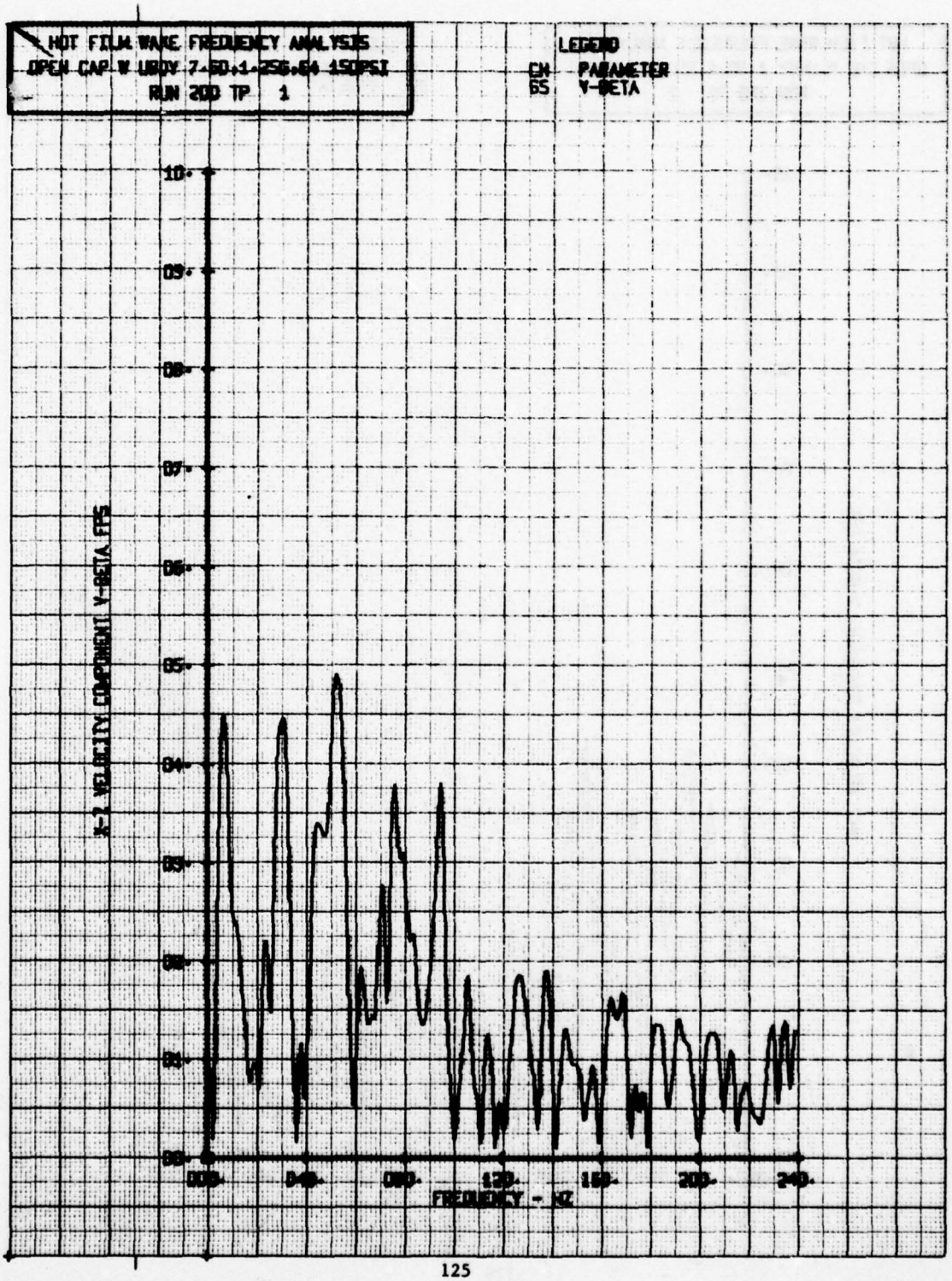
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7-80-1-256-64 150PSI
RUN 200 TP 1
LEGEND
CH PARAMETER
65 V-BETA
X-2 VELOCITY COMPONENT V-BETA, FPS
FREQUENCY - HZ
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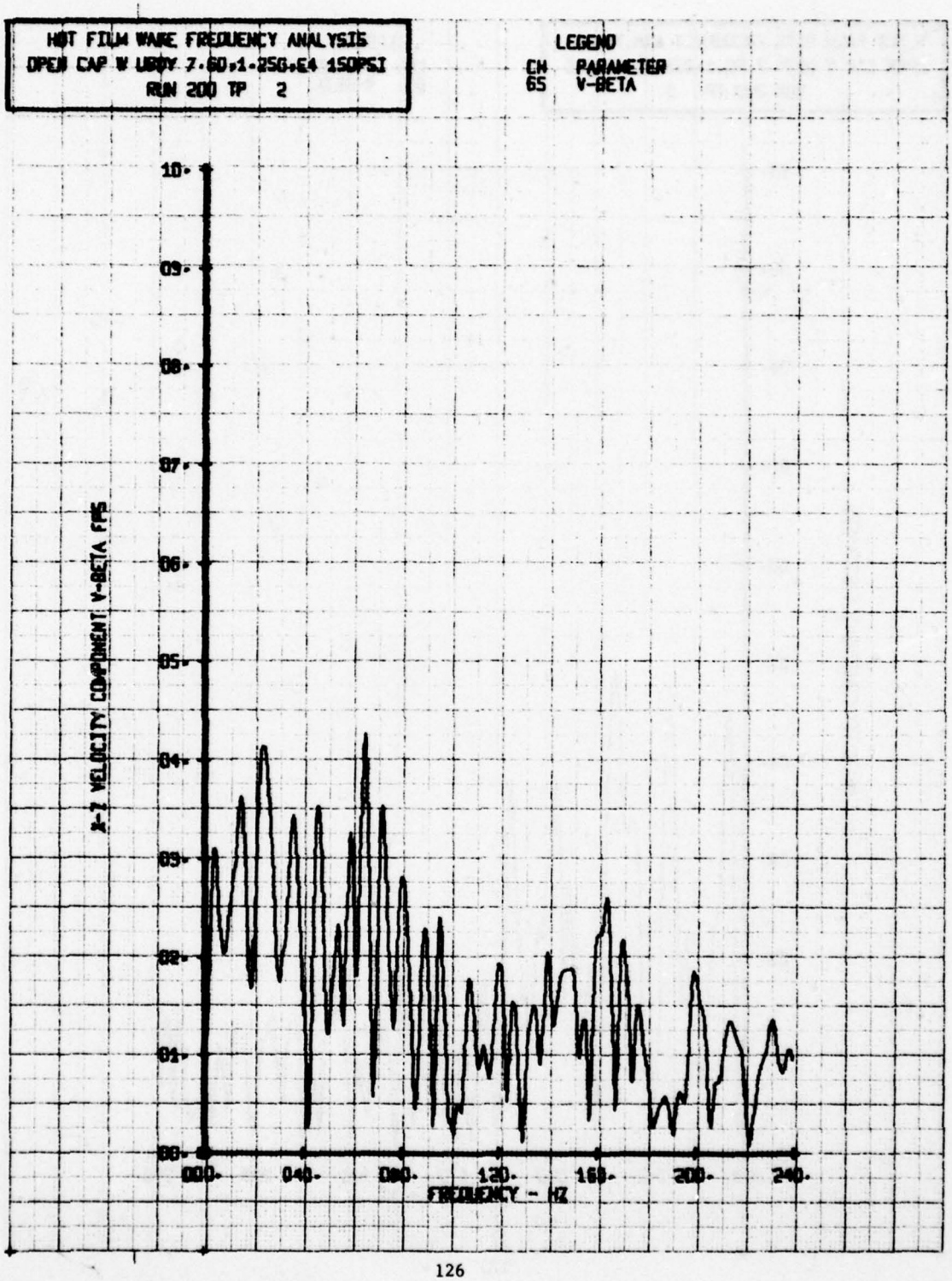
HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.60,1.25G,E4 150PSI
RUN 200 TP 2
LEGEND
CH PARAMETER
65 V-BETA
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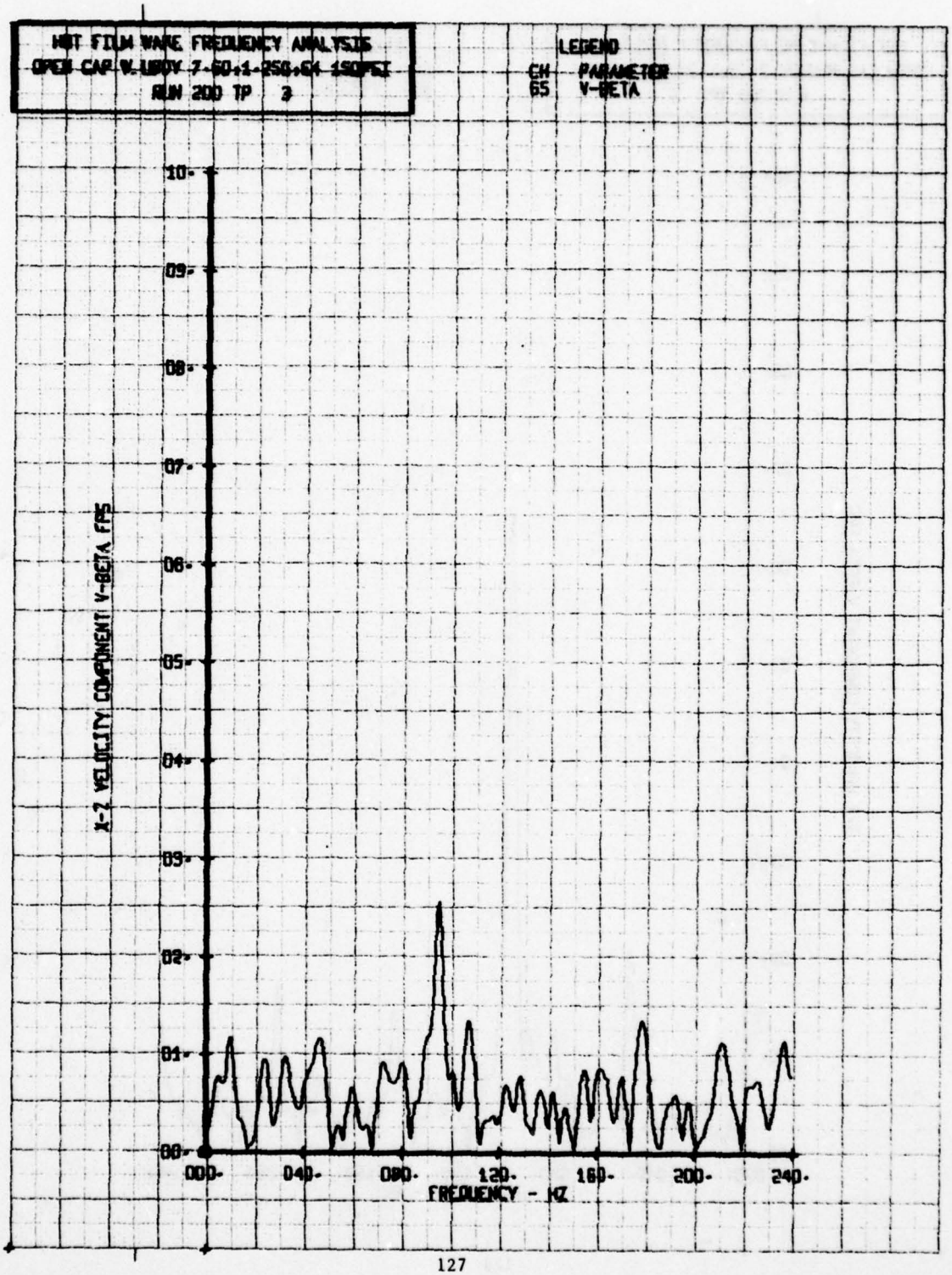
FREQUENCY - HZ
X-Z VELOCITY COMPONENT V-BETA FPS


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP V.UBOV 7.50+1.250+04 1SOPSI
RUN 200 TP 3
LEGEND
CH PARAMETER
65 V-BETA
X-2 VELOCITY COMPONENT V-BETA FPS
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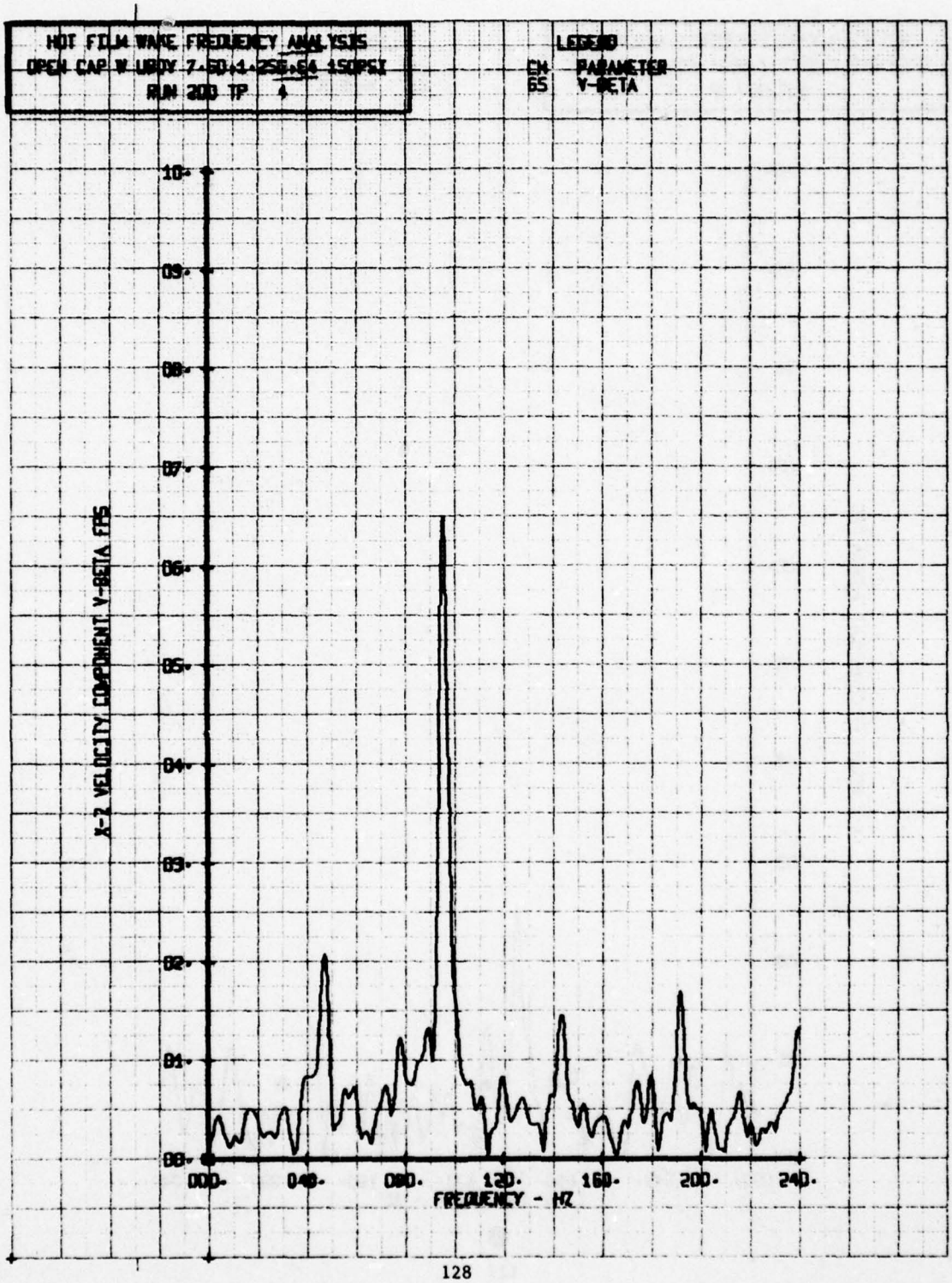
FREQUENCY - KZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W BODY 7.50+1.25E+04 150PSI
RUN 200 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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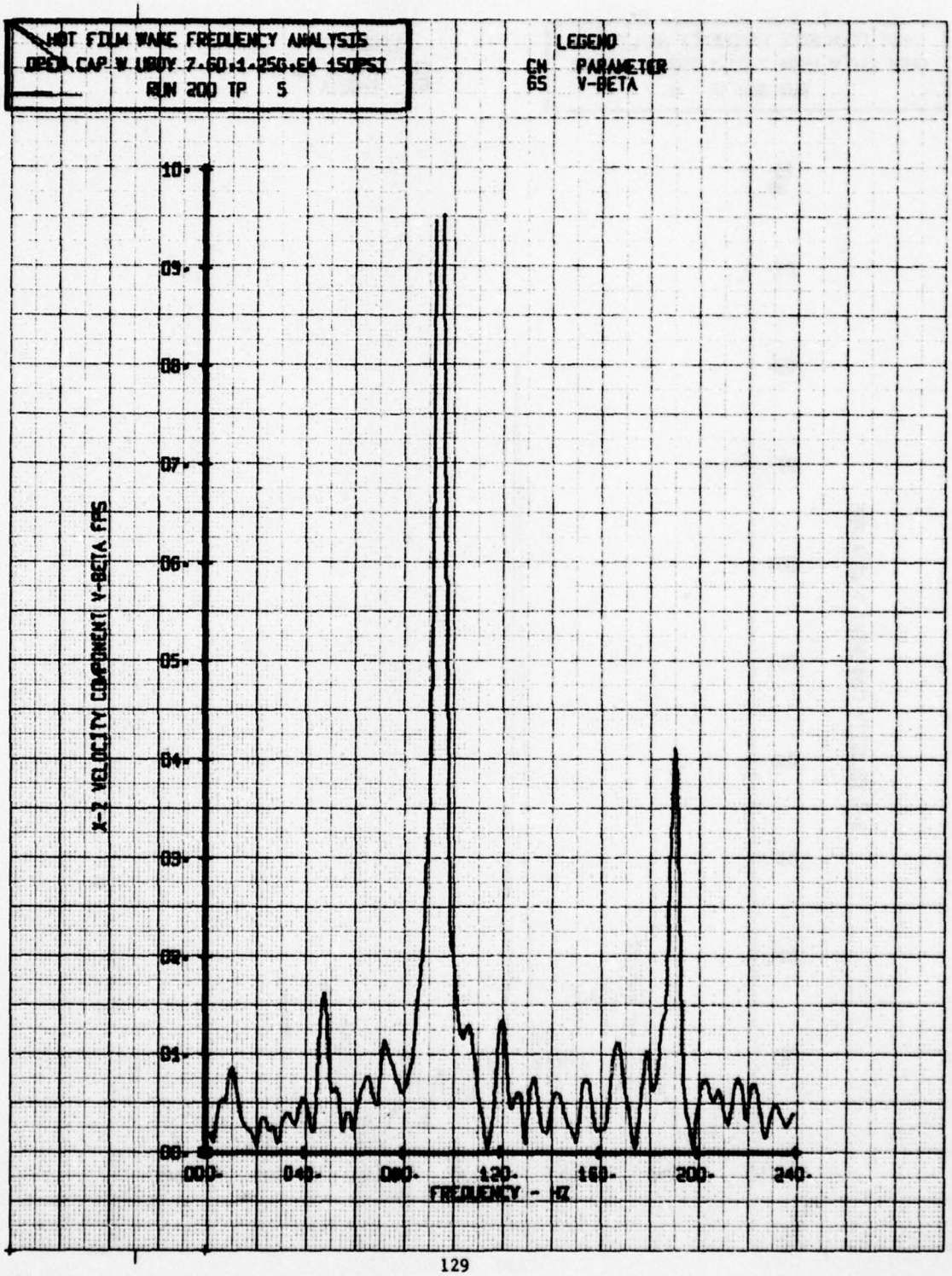
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UNDY 2.60+1.250+E4 150PSI
RUN 200 TP 5
LEGEND
CH PARAMETER
65 V-BETA
X-2 VELOCITY COMPONENT V-BETA, FPS
10.
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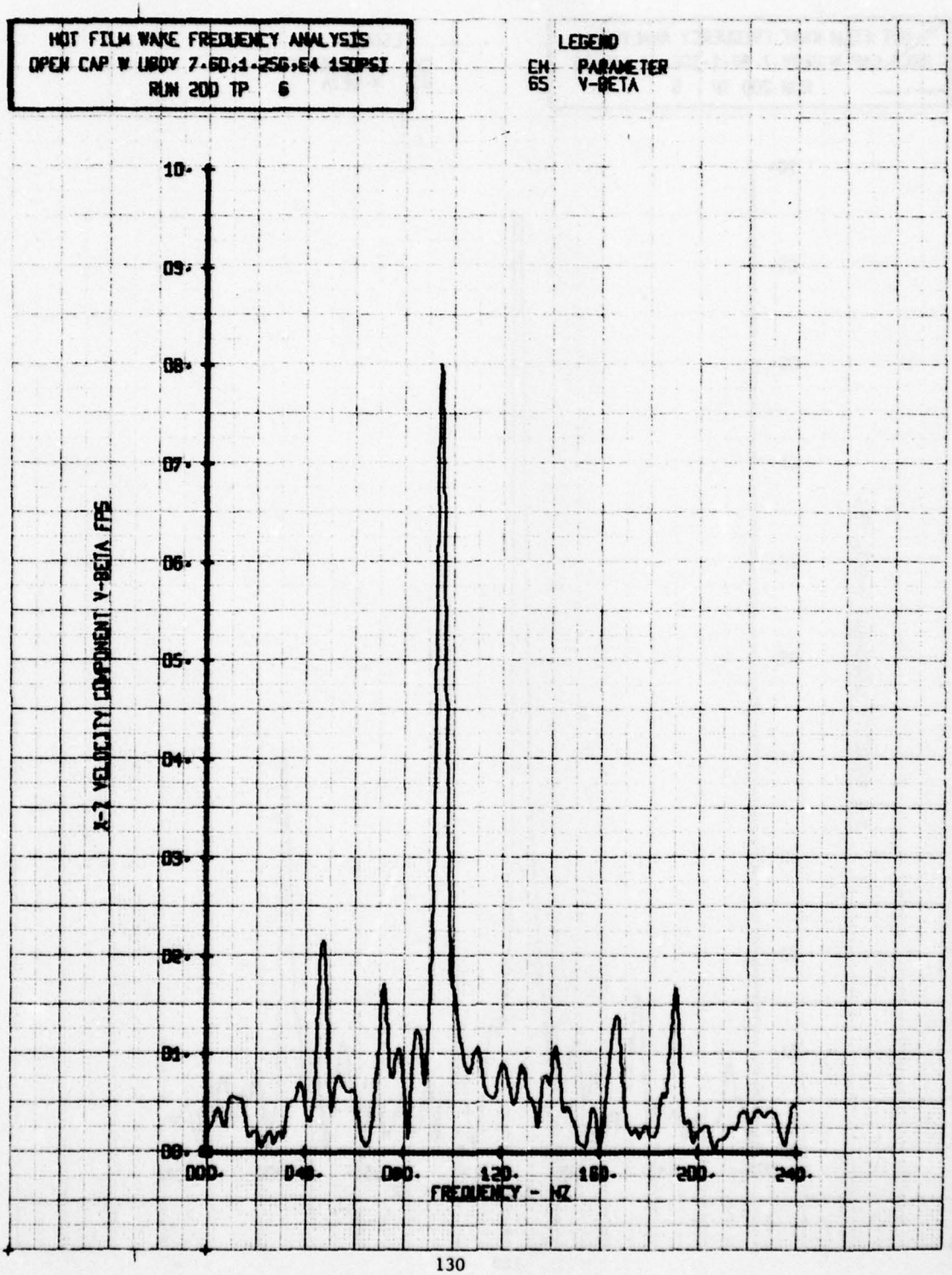
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 7.6D,1.25G,E4 150PSI
RUN 200 TP 6
LEGEND
EN PARAMETER
6S V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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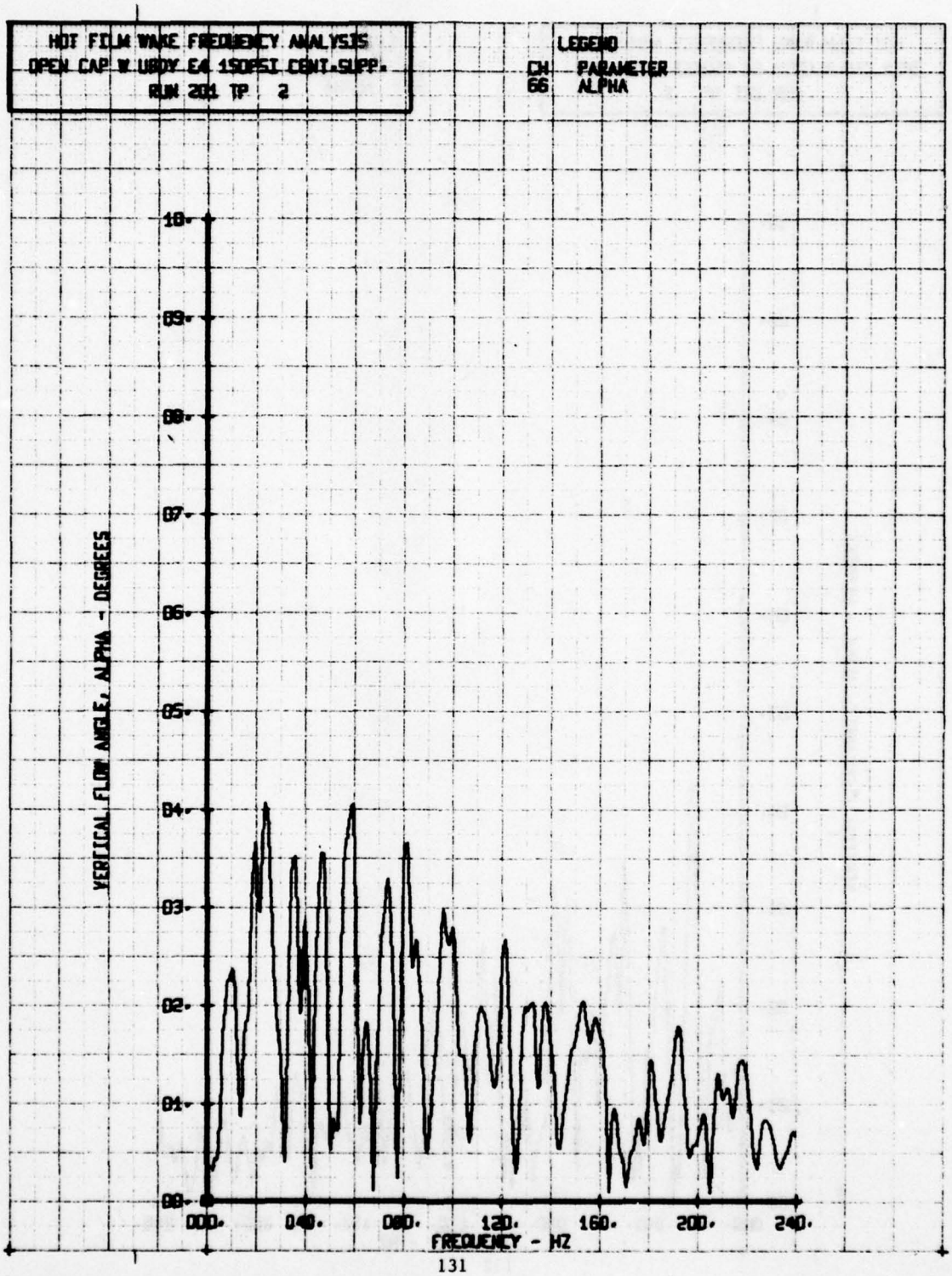
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY EA 150PSI CENT.SUPP.
RUN 201 TP 2
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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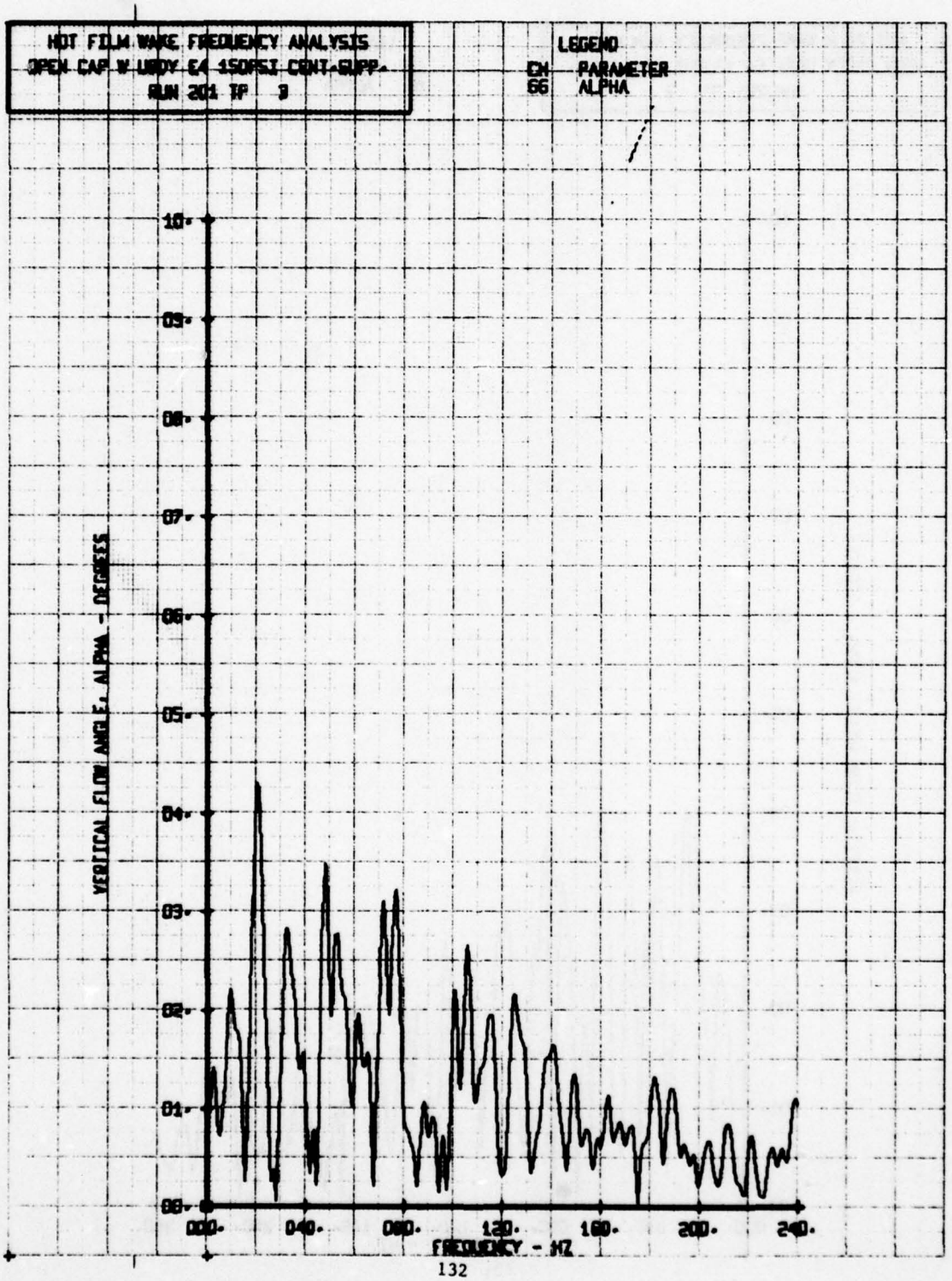
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY EX 150PSI CONT-SUPP.
RUN 201 TP 3
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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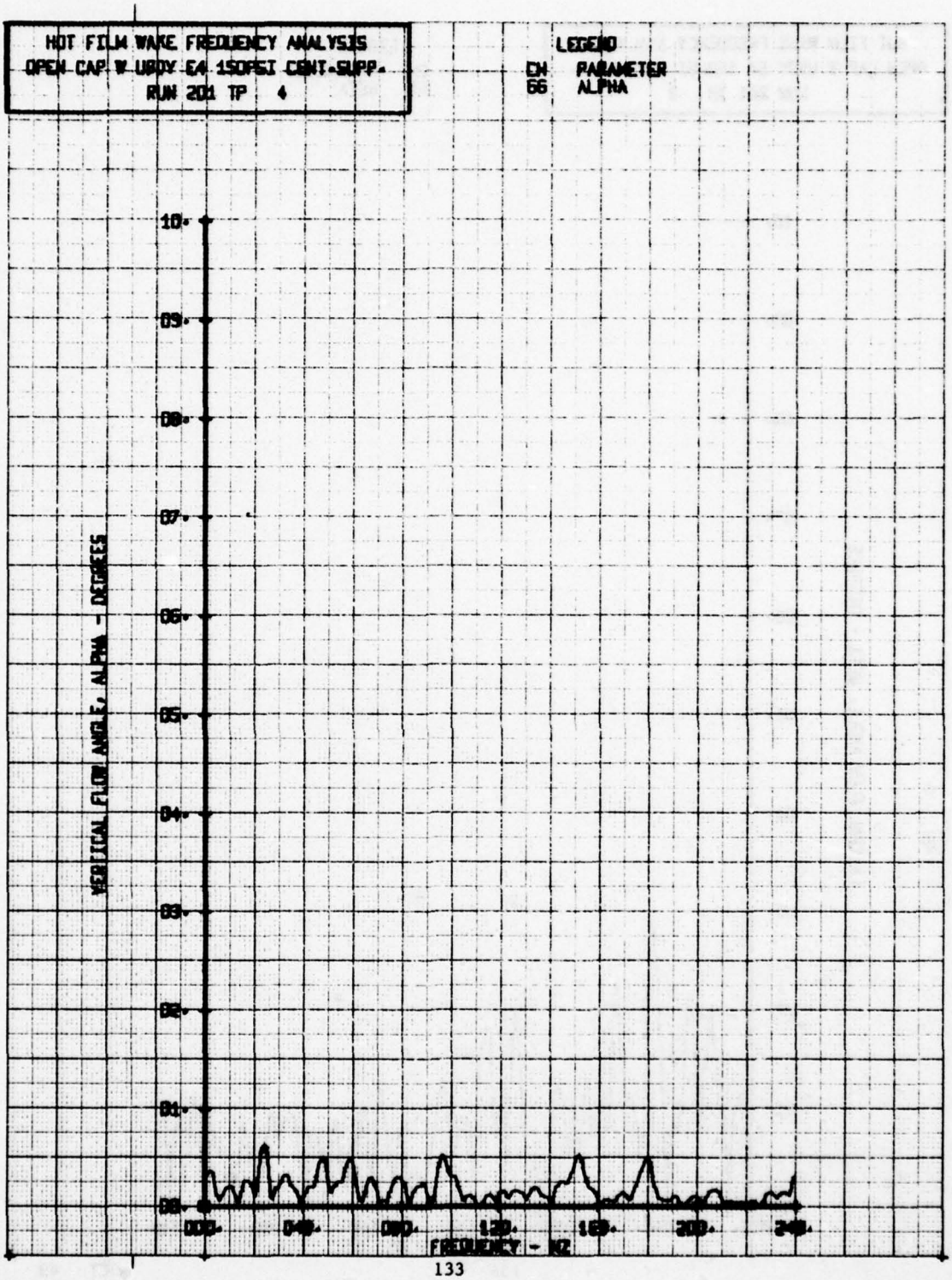
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY 64 150PSI CENT-SUPP.
RUN 201 TP 4
LEGEND
CH PARAMETER
66 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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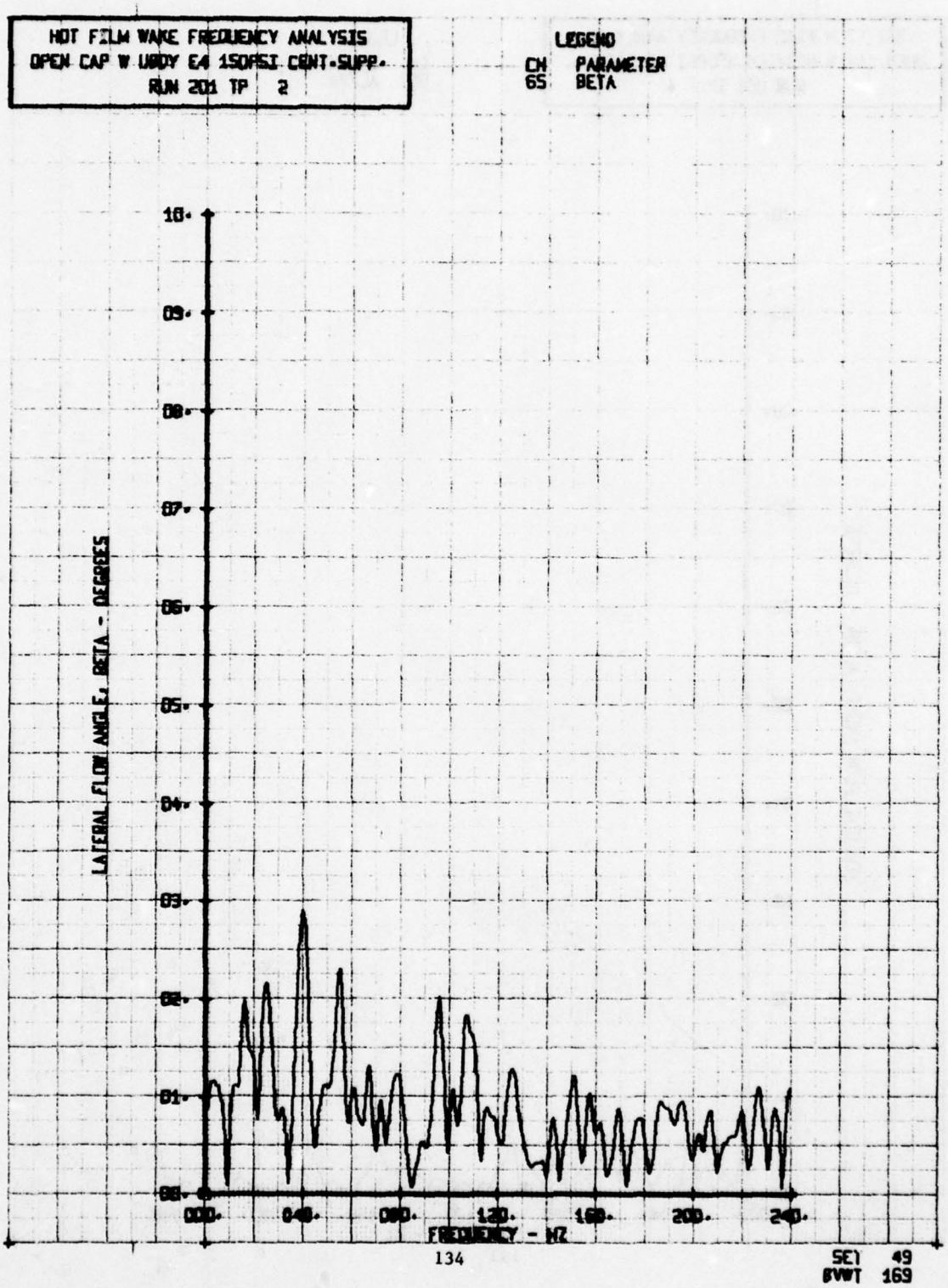
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY E4 150PSI CENT-SUPP.
RUN 201 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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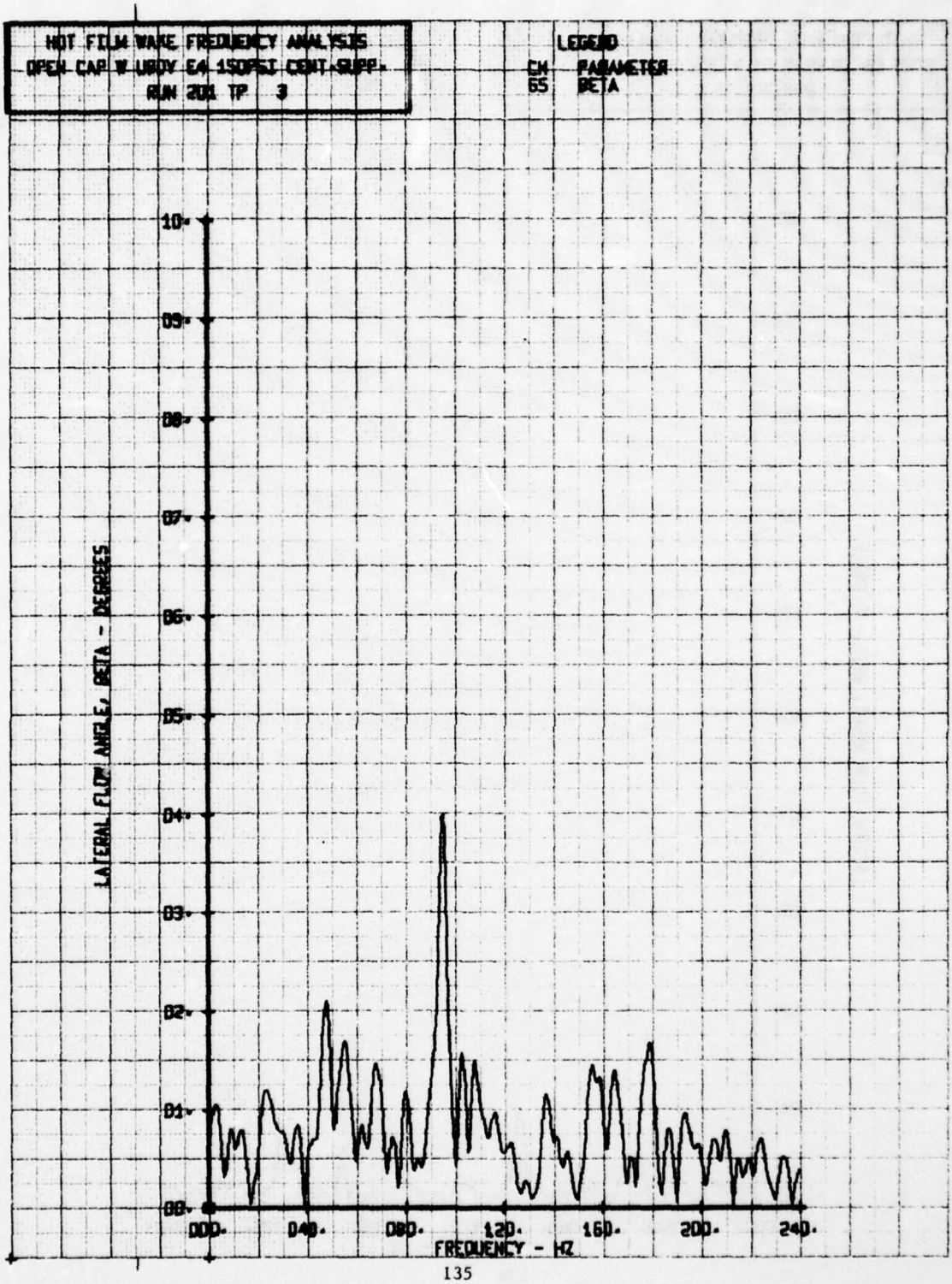
FREQUENCY - HZ
SE1 49
BWT 169


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBOV E4 150PSI CENT-SUPP.
RUN 201 TP 3
LEGEND
CM PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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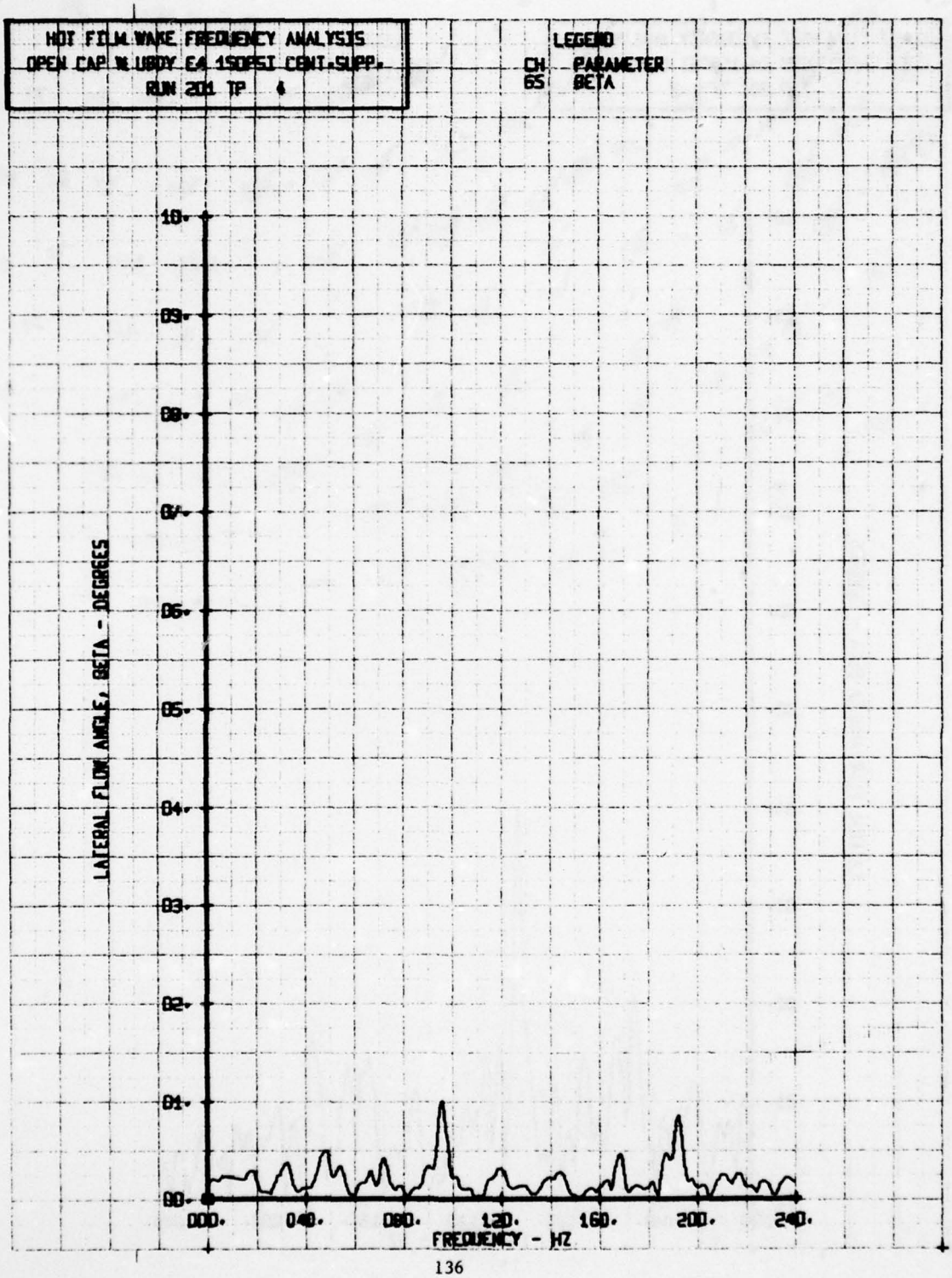
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W. UBDY EA 150PSI CONT.SUPP.
RUN 201 TP 4
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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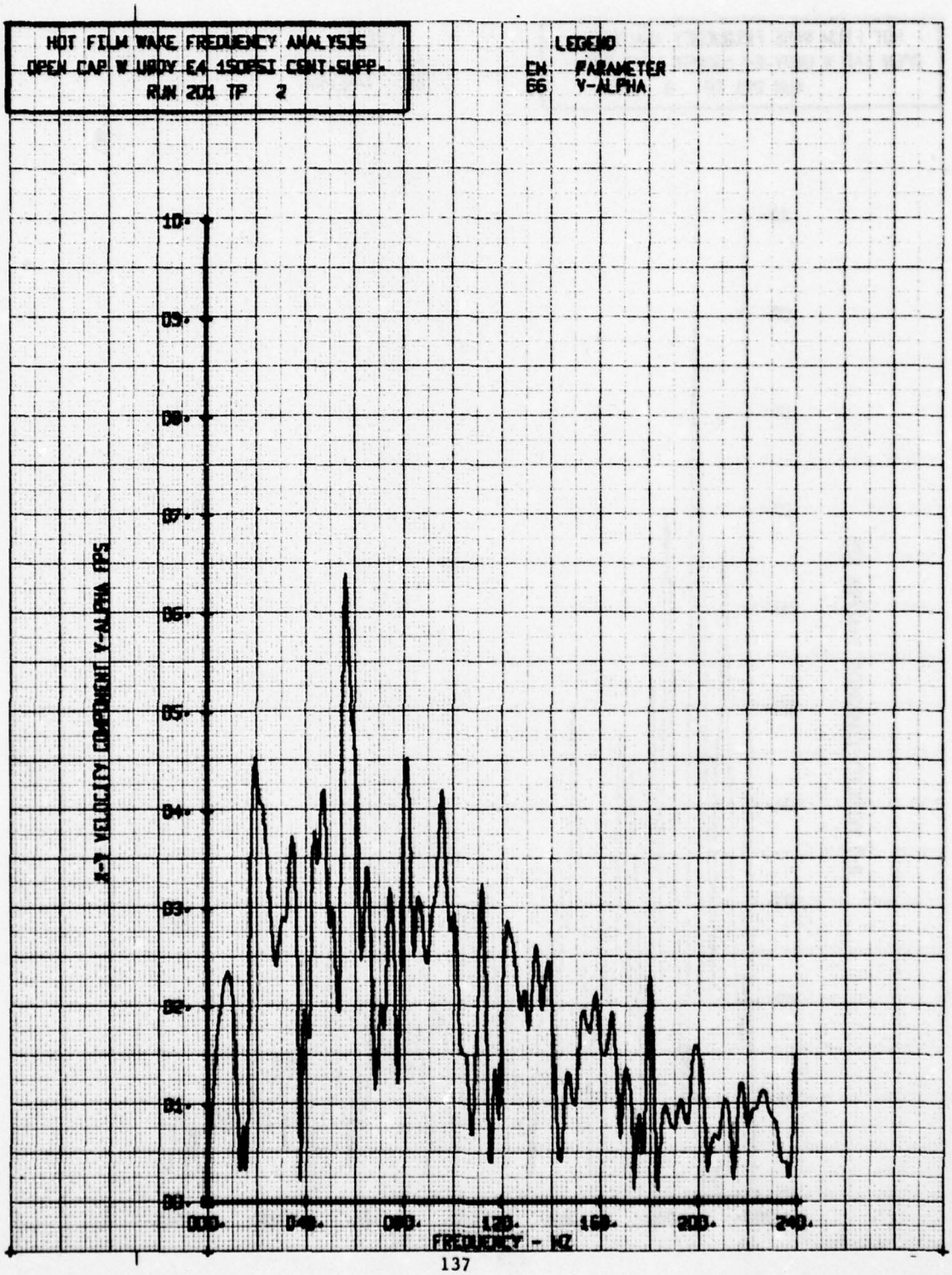
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UROV E4 150PSI CONT-SUPP.
RUN 201 TP 2
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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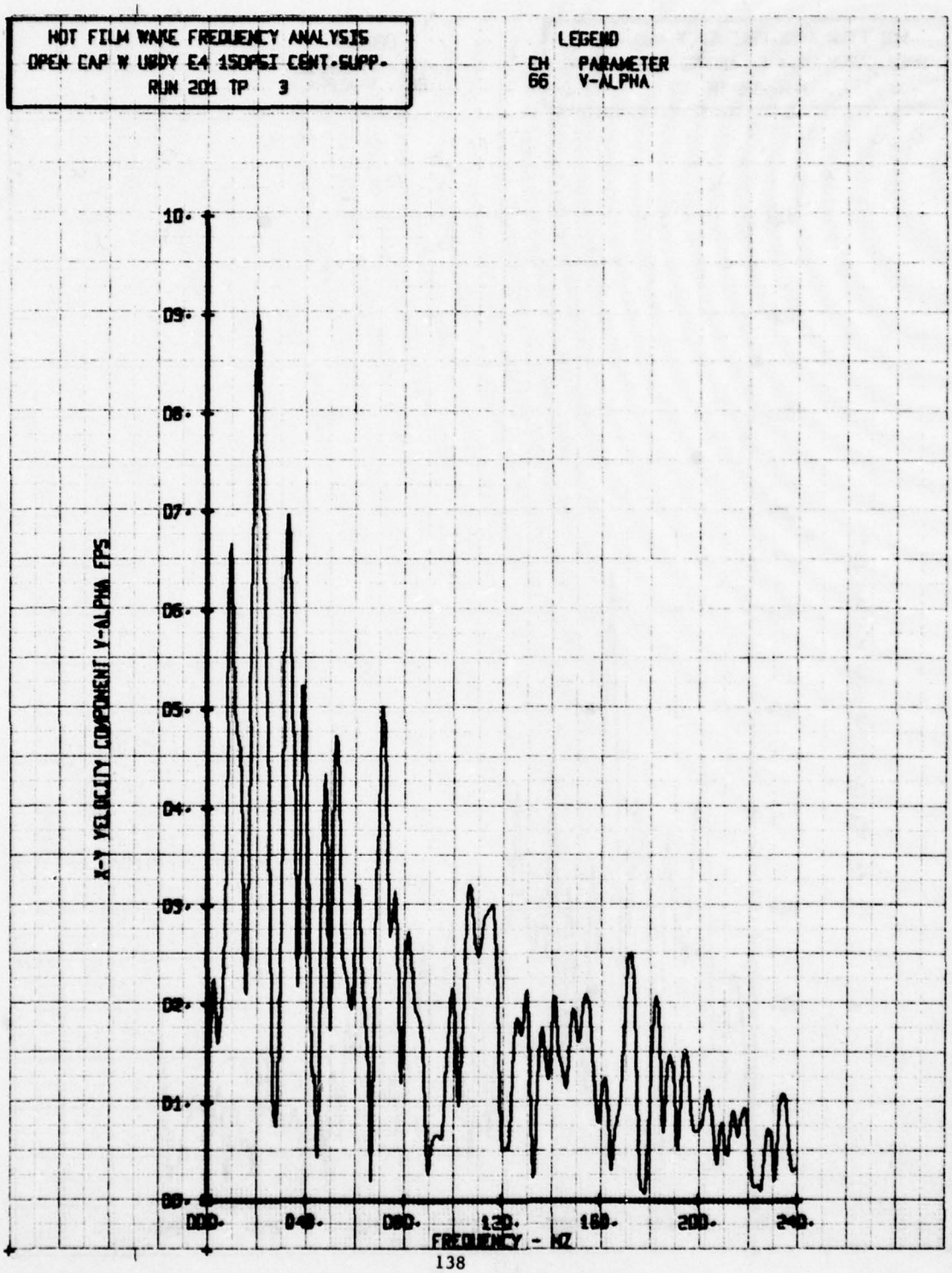
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY E4 15DPSI CENT-SUPP-
RUN 201 TP 3
LEGEND
CH PARAMETER
66 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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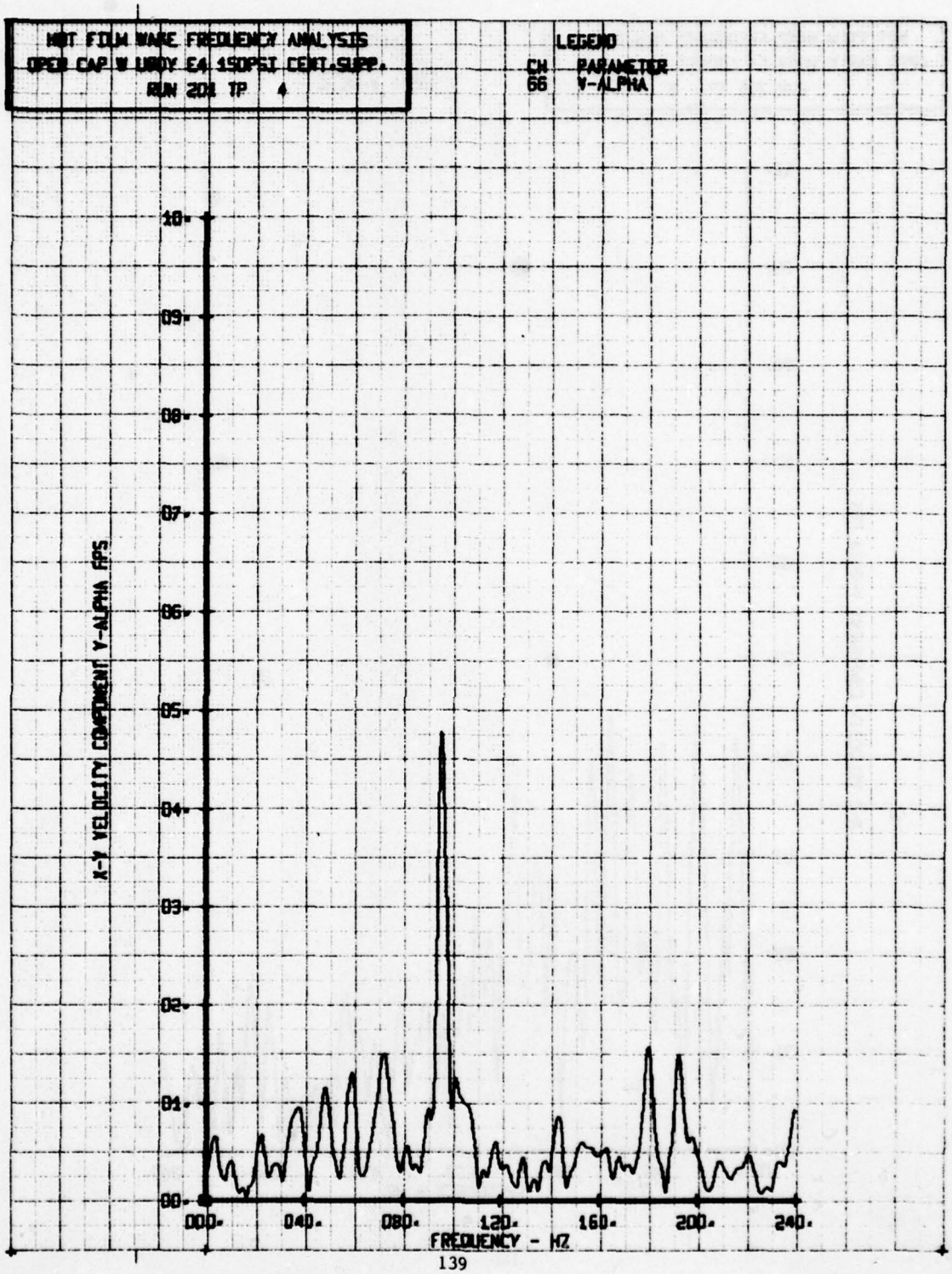
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UNDY E4 150PSI CENT.SUPP.
RUN 208 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
X-Y VELOCITY COMPONENT V-ALPHA FPS
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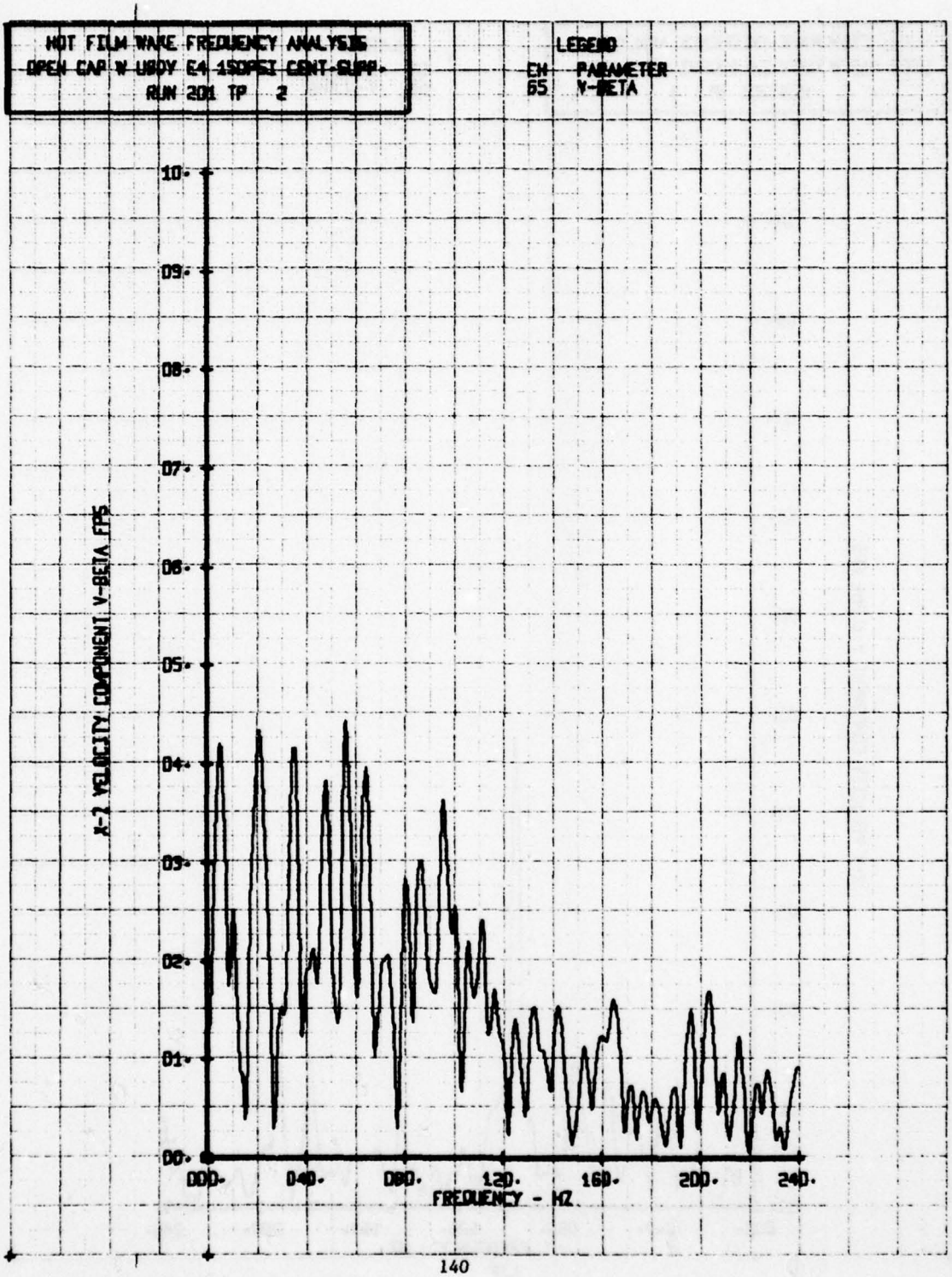
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY E4 150PSI CENT-SUPP.
RUN 201 TP 2
LEGEND
CH PARAMETER
65 V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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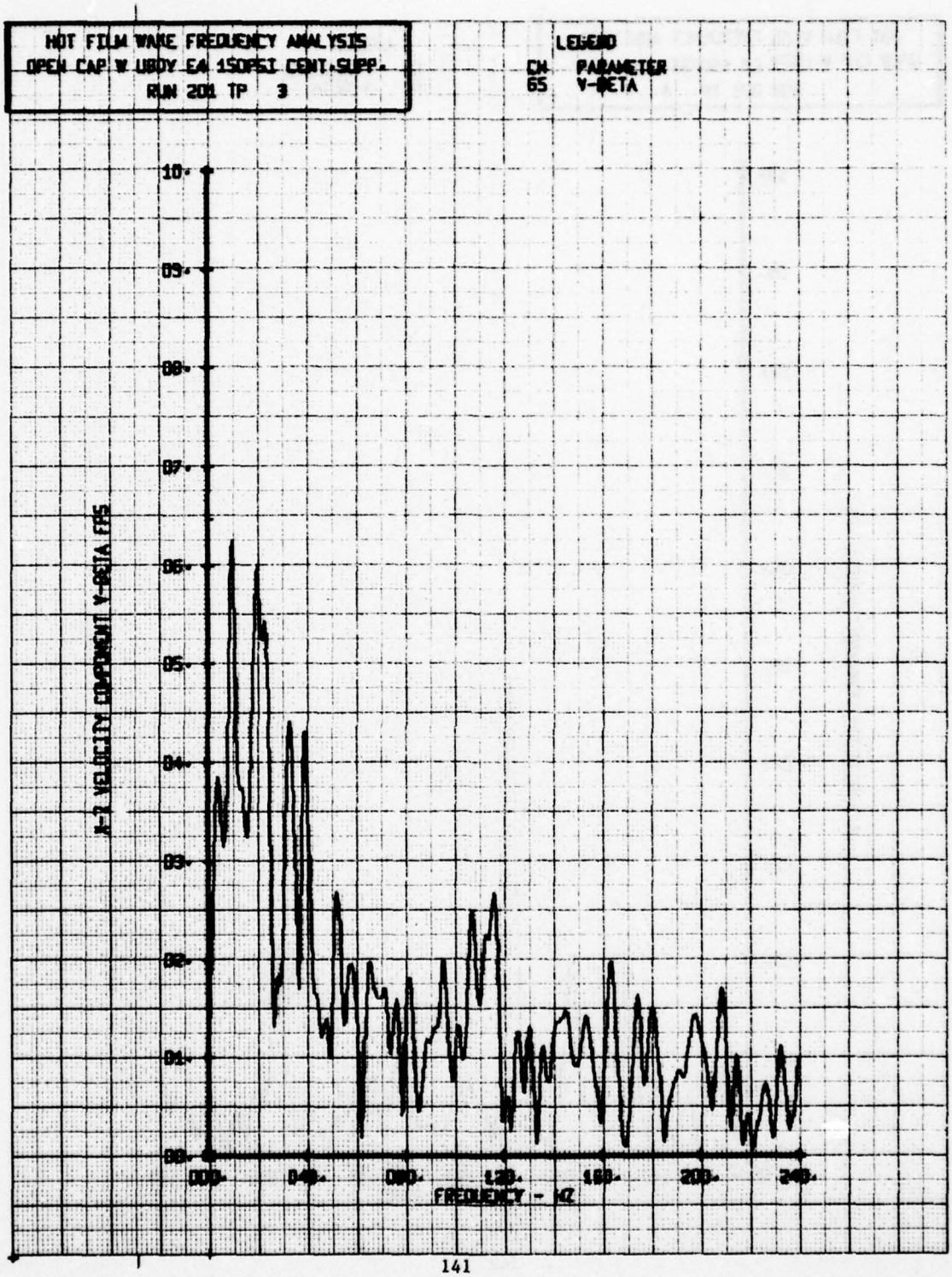
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBDY EA 150PSI CENT.SUPP.
RUN 201 TP 3
LEGEND
CH PARAMETER
65 V-BETA
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A-2 VELOCITY COMPONENT V-BETA FPS
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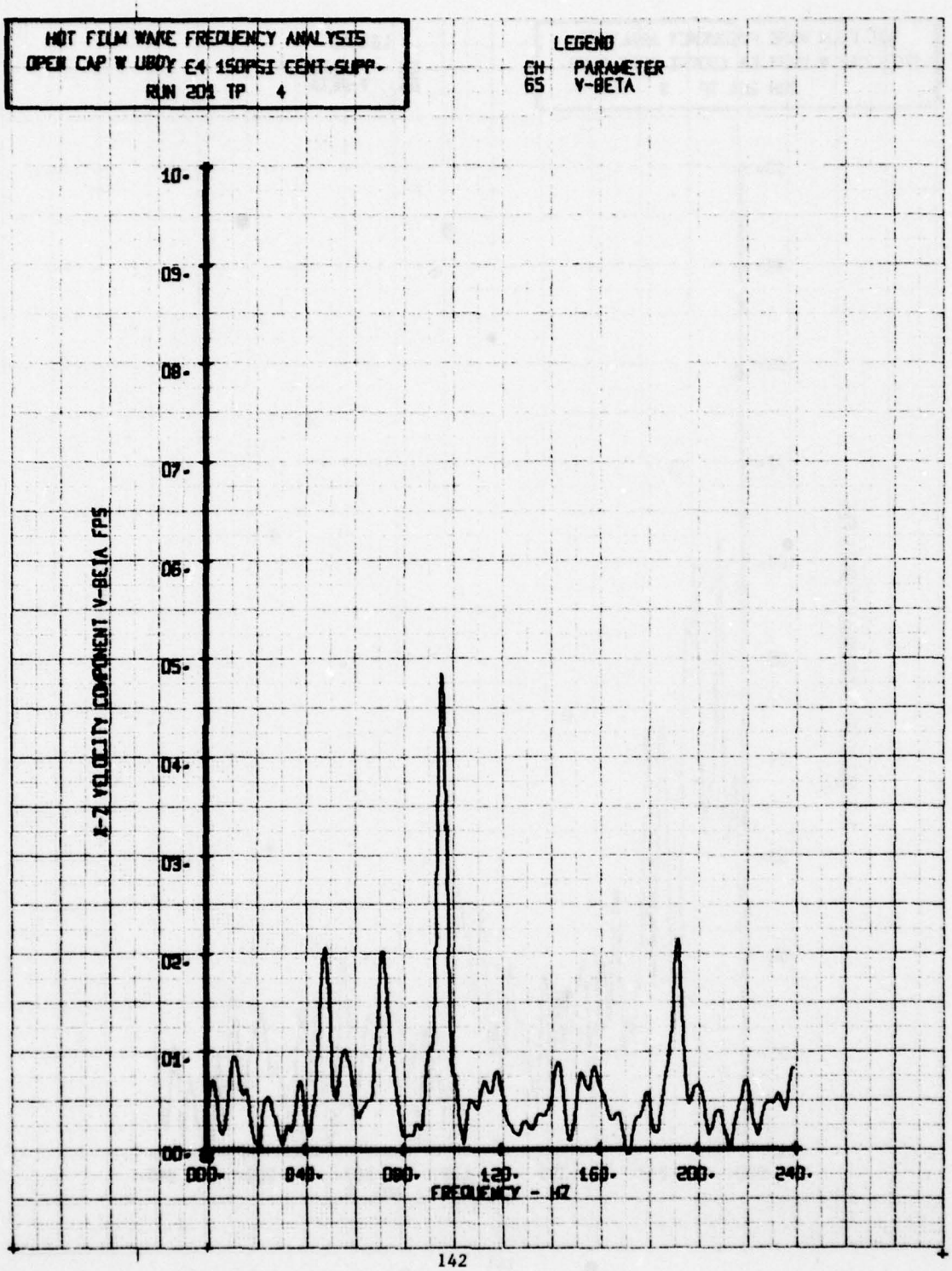
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
OPEN CAP W UBOY E4 150PSI CENT-SUPP-
RUN 201 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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X-Z VELOCITY COMPONENT V-BETA FPS
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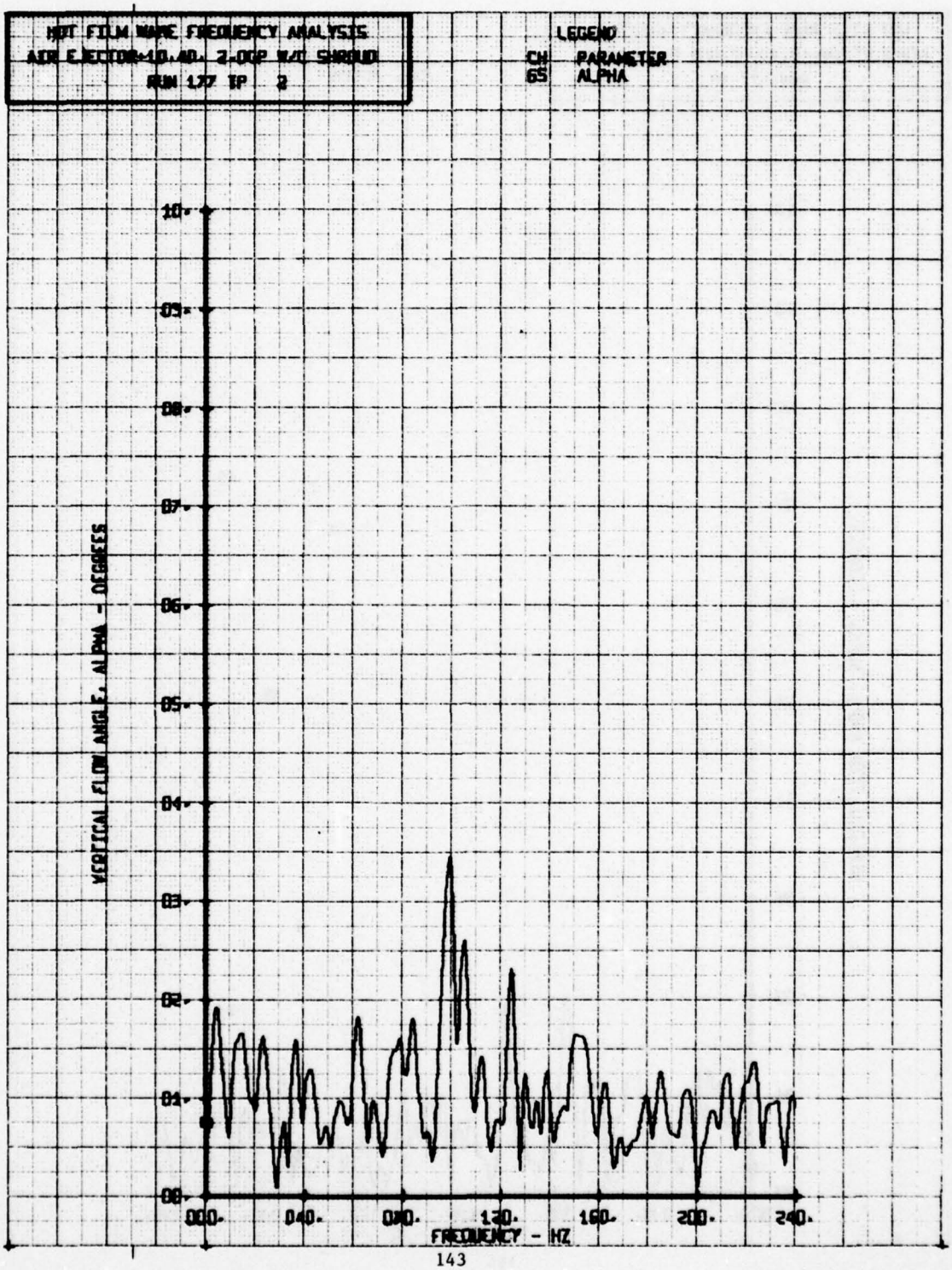
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTION=10.40, 2.00P W/O SHROUD
RUN 177 TP 2
LEGEND
CH PARAMETER
65 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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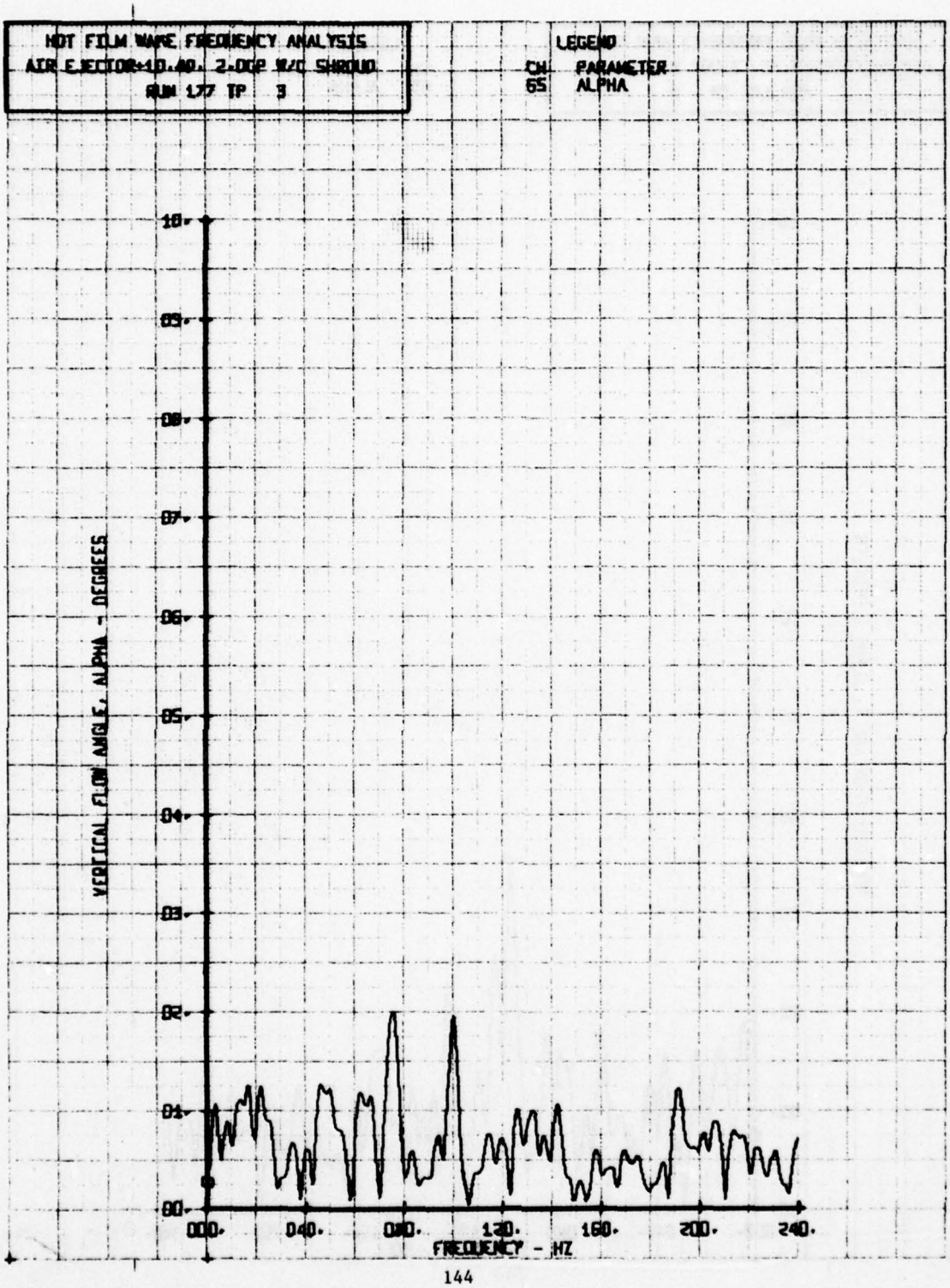
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR=10.40, 2.DEP W/O SHROUD
RUN 177 TP 3
LEGEND
CH PARAMETER
65 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
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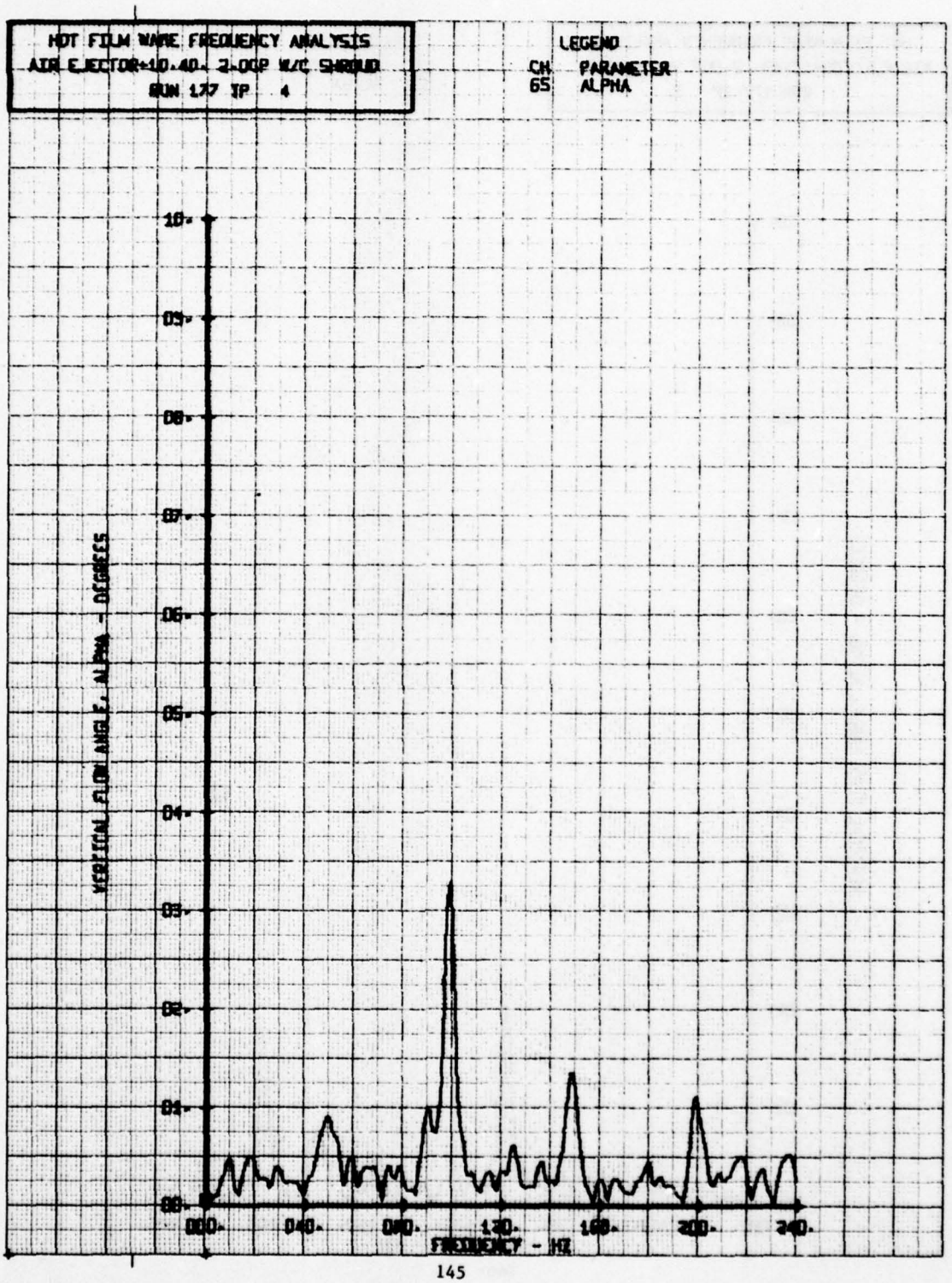
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+10.40. 2.00P W/C SHROUD
RUN 177 TP 4
LEGEND
CH PARAMETER
65 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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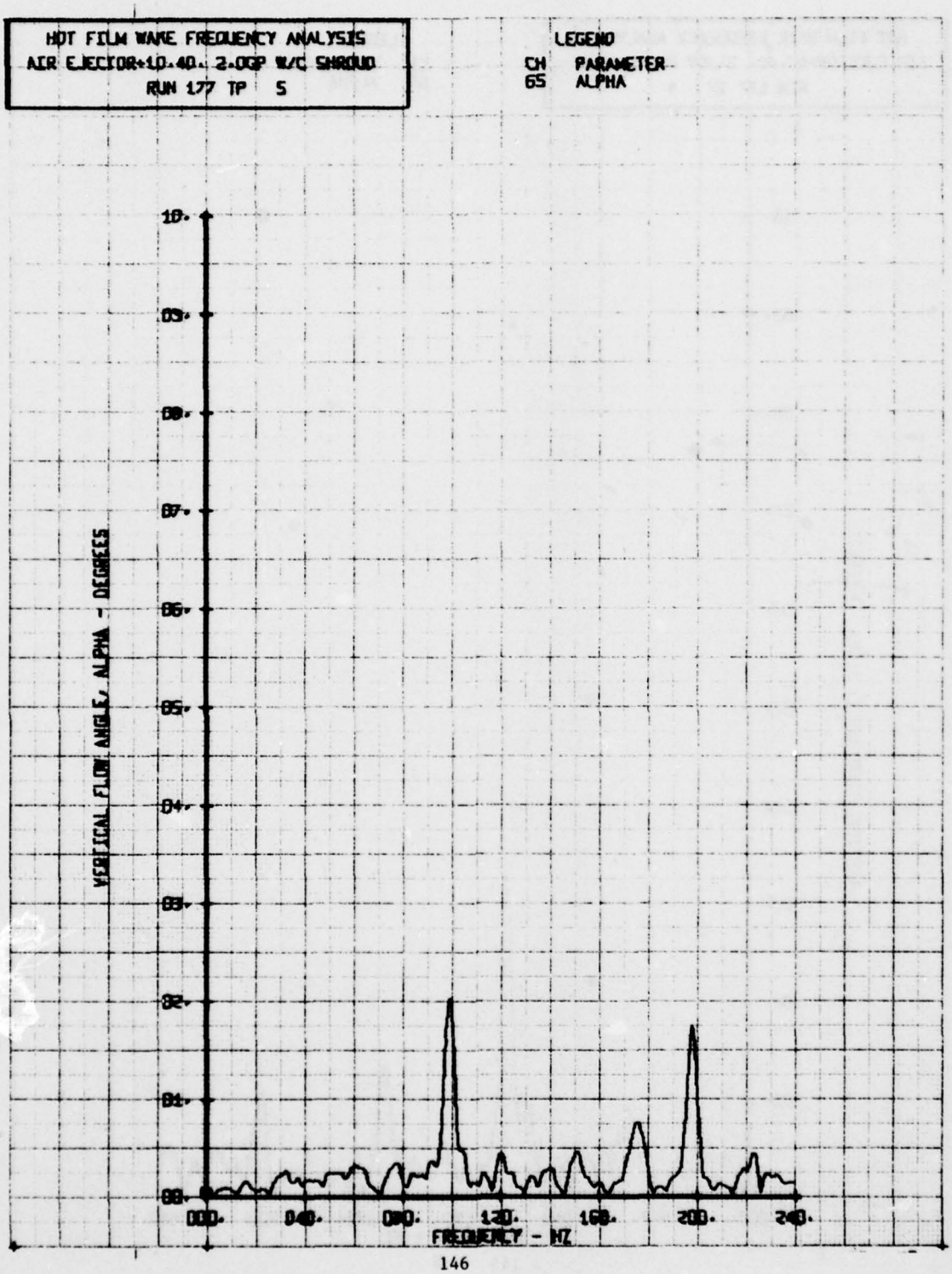
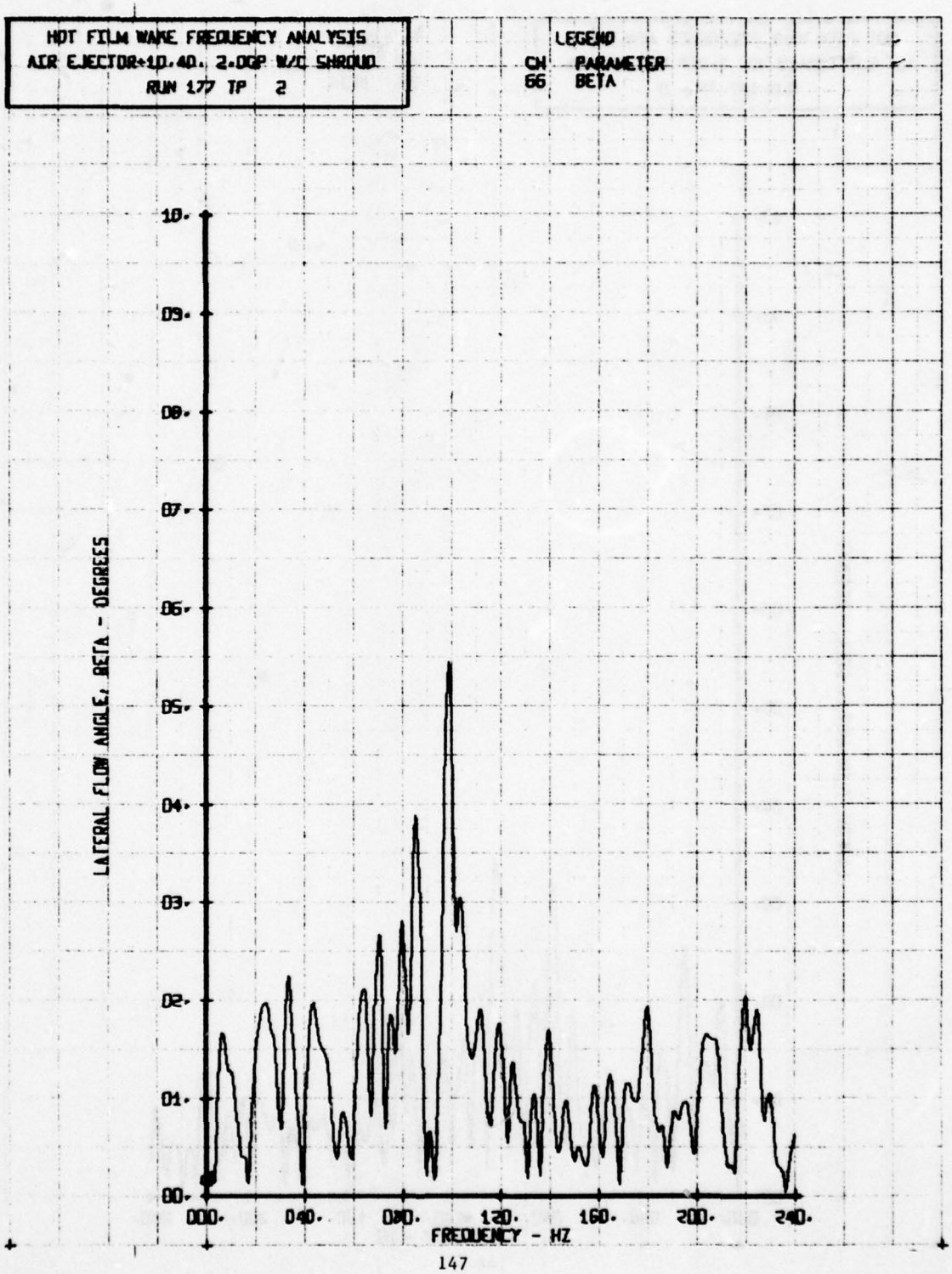
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+1D.40. 2.00P W/C SHROUD
RUN 177 TP 5
LEGEND
CH PARAMETER
65 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+10.40. 2.00P W/C SHROUD
RUN 177 TP 2
LEGEND
CH PARAMETER
66 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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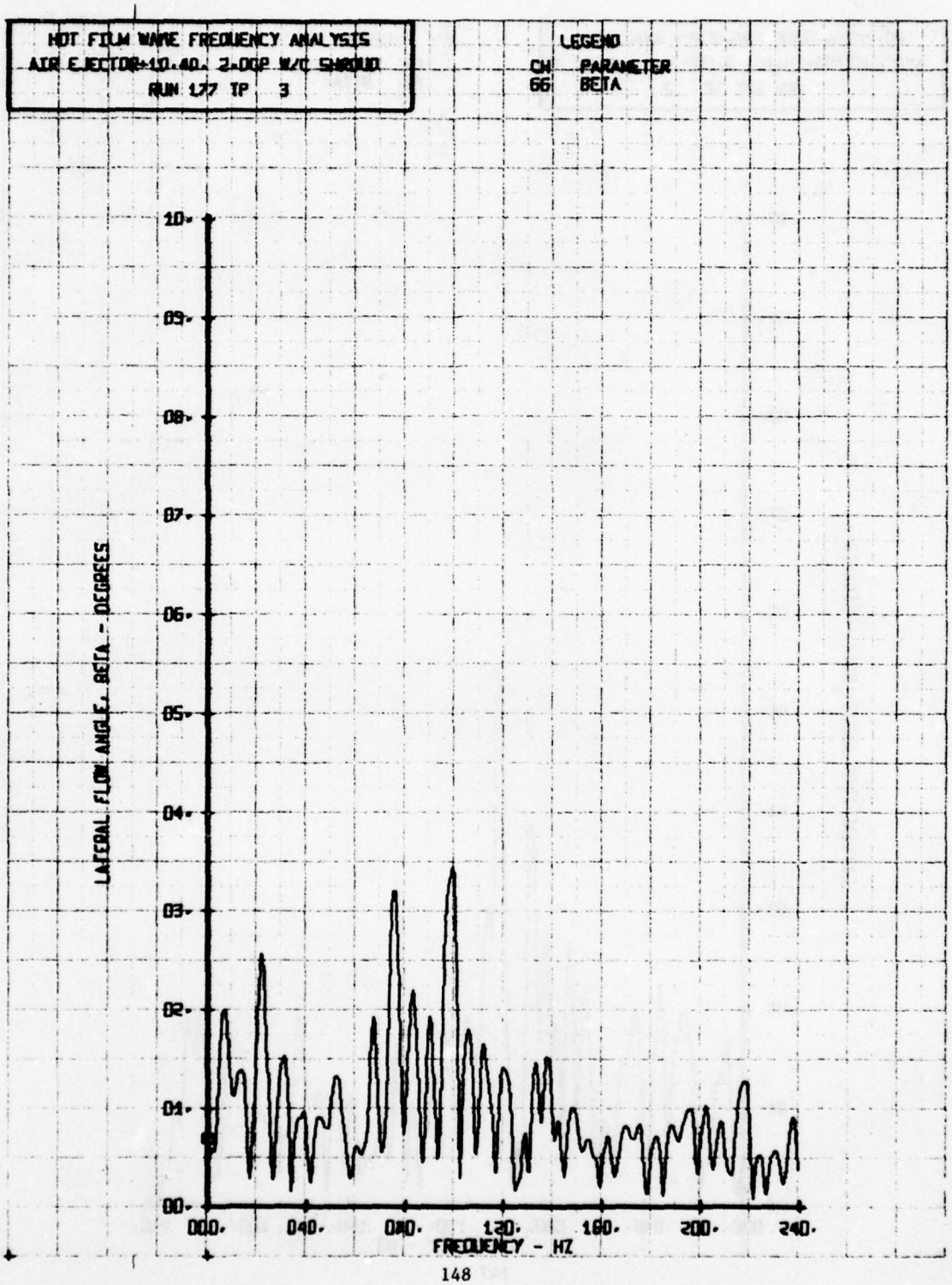
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+10.40. 2-DOP W/C SHROUD
RUN 177 TP 3
LEGEND
CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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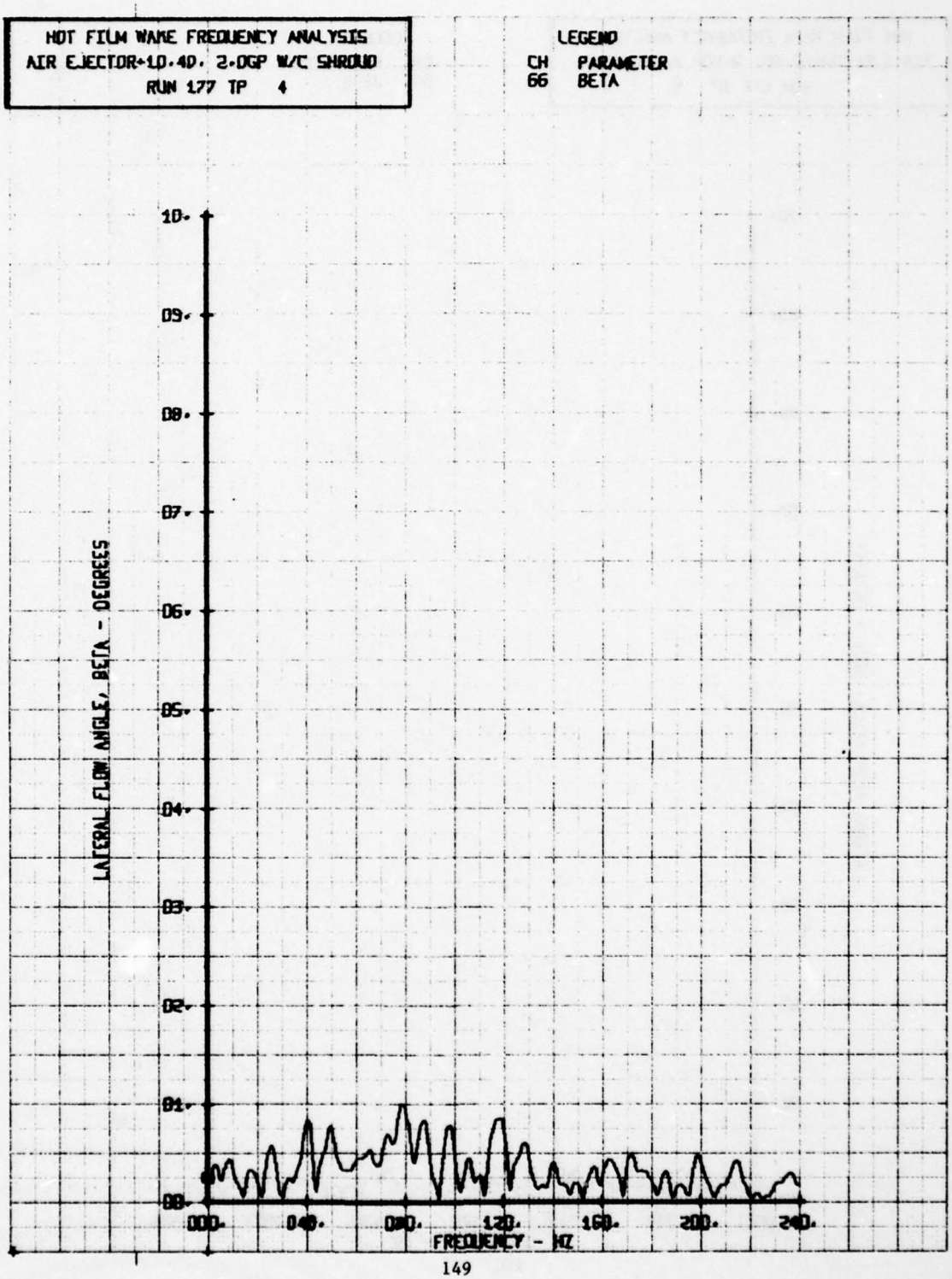
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+LD.4D. 2.0GP W/C SHROUD
RUN 177 TP 4
LEGEND
CH PARAMETER
66 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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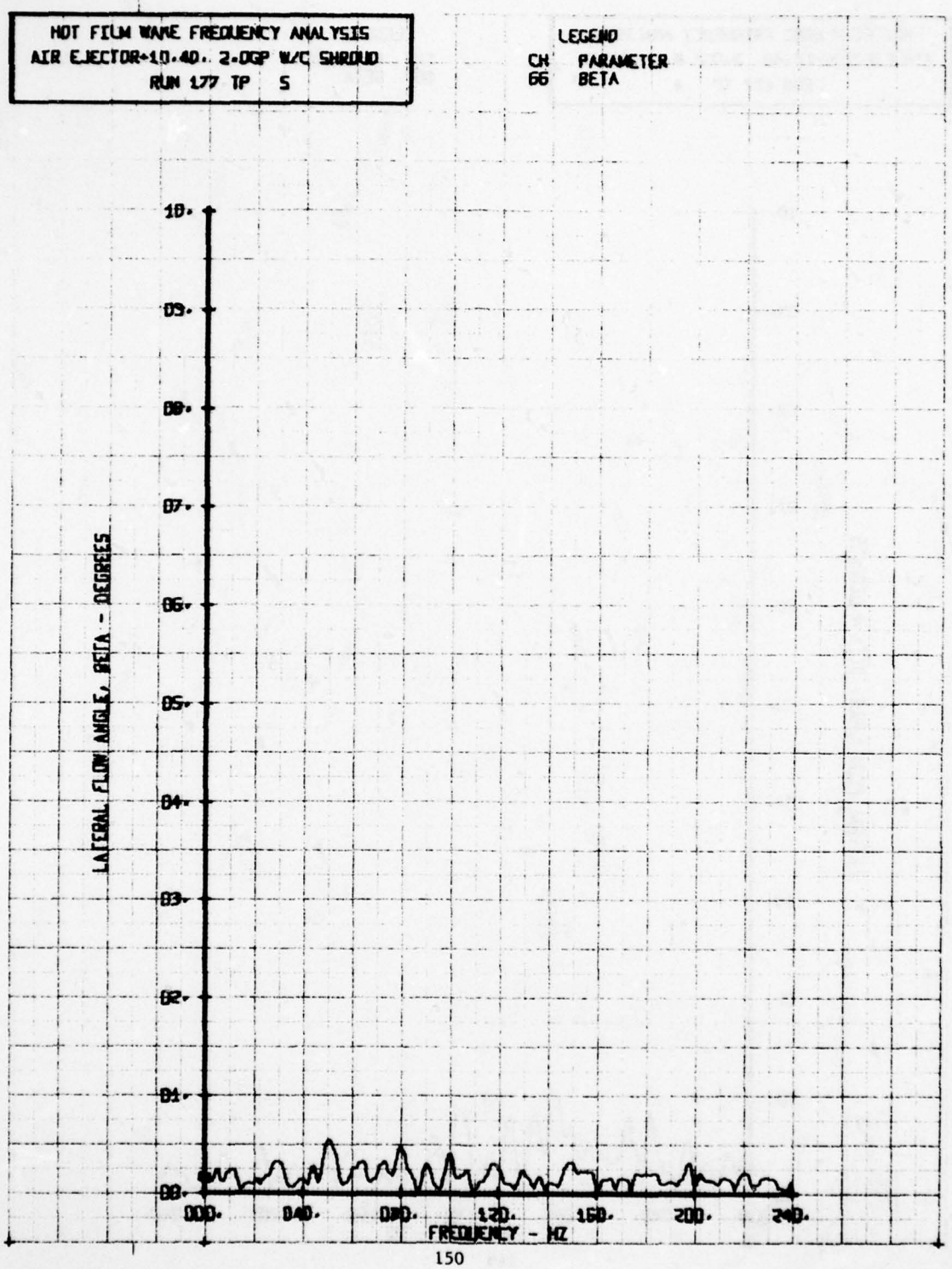
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+10.40.. 2.DGP W/C SHROUD
RUN 177 TP 5
LEGEND
CH PARAMETER
66 BETA
10.
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LATERAL FLOW ANGLE, BETA - DEGREES
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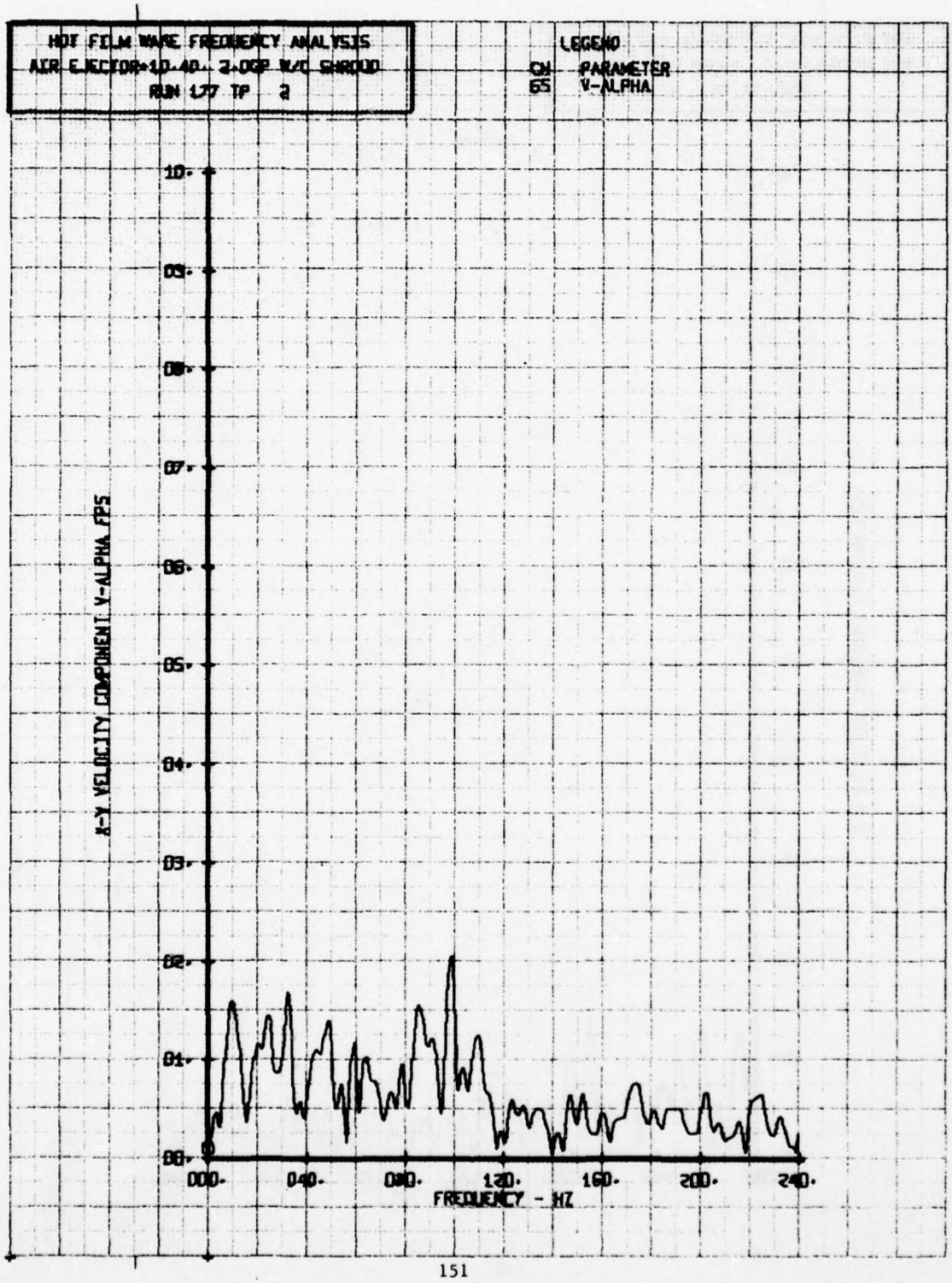
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR=10.40.. 2.00P W/O SHROUD
RUN 177 TP 2
LEGEND
CH PARAMETER
65 V-ALPHA
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X-Y VELOCITY COMPONENT V-ALPHA FPS
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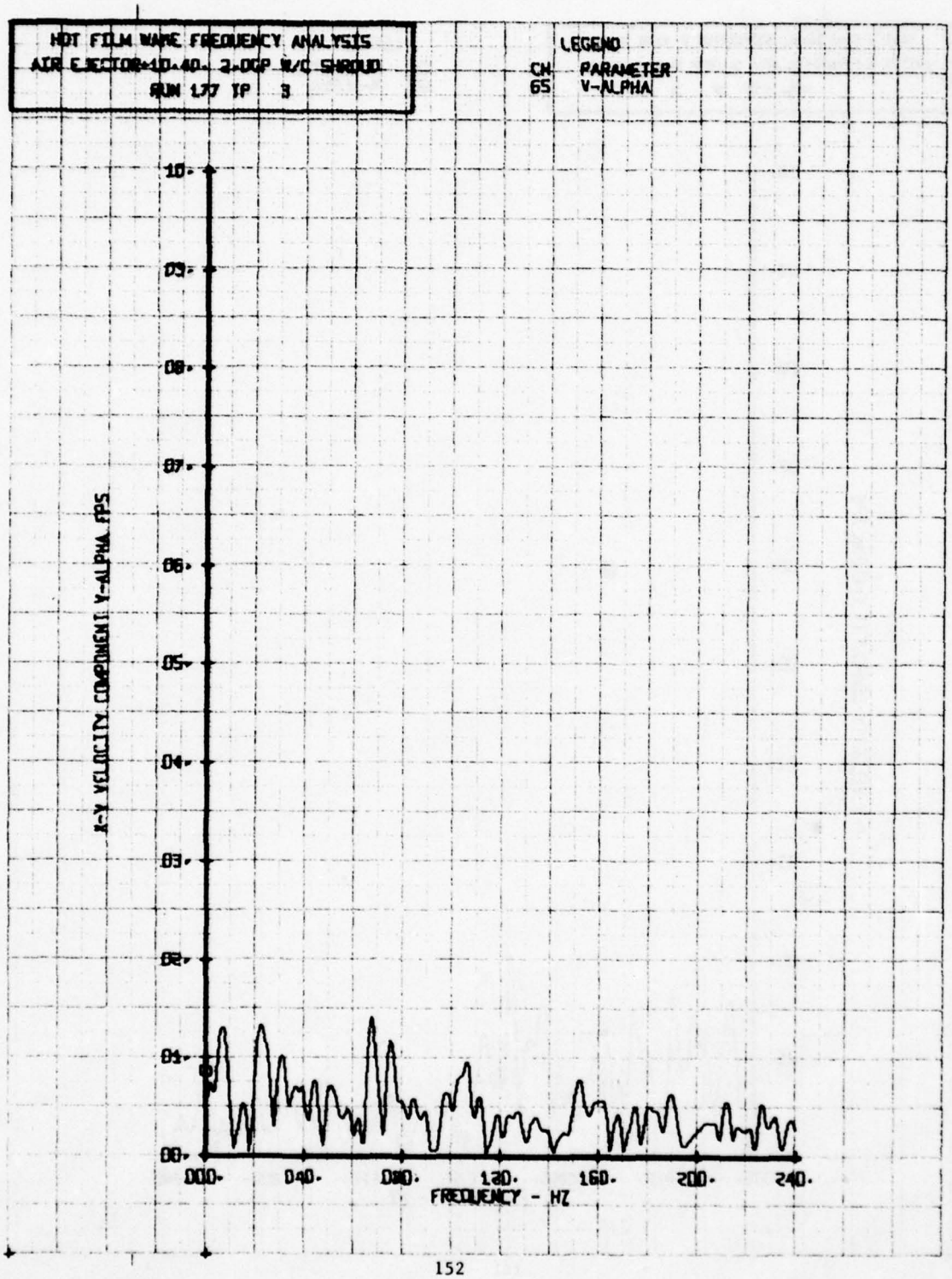
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR=10.40. 2-DCP W/O SHROUD
RUN 177 TP 3
LEGEND
CH PARAMETER
65 V-ALPHA
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X-Y VELOCITY COMPONENT Y-ALPHA FPS
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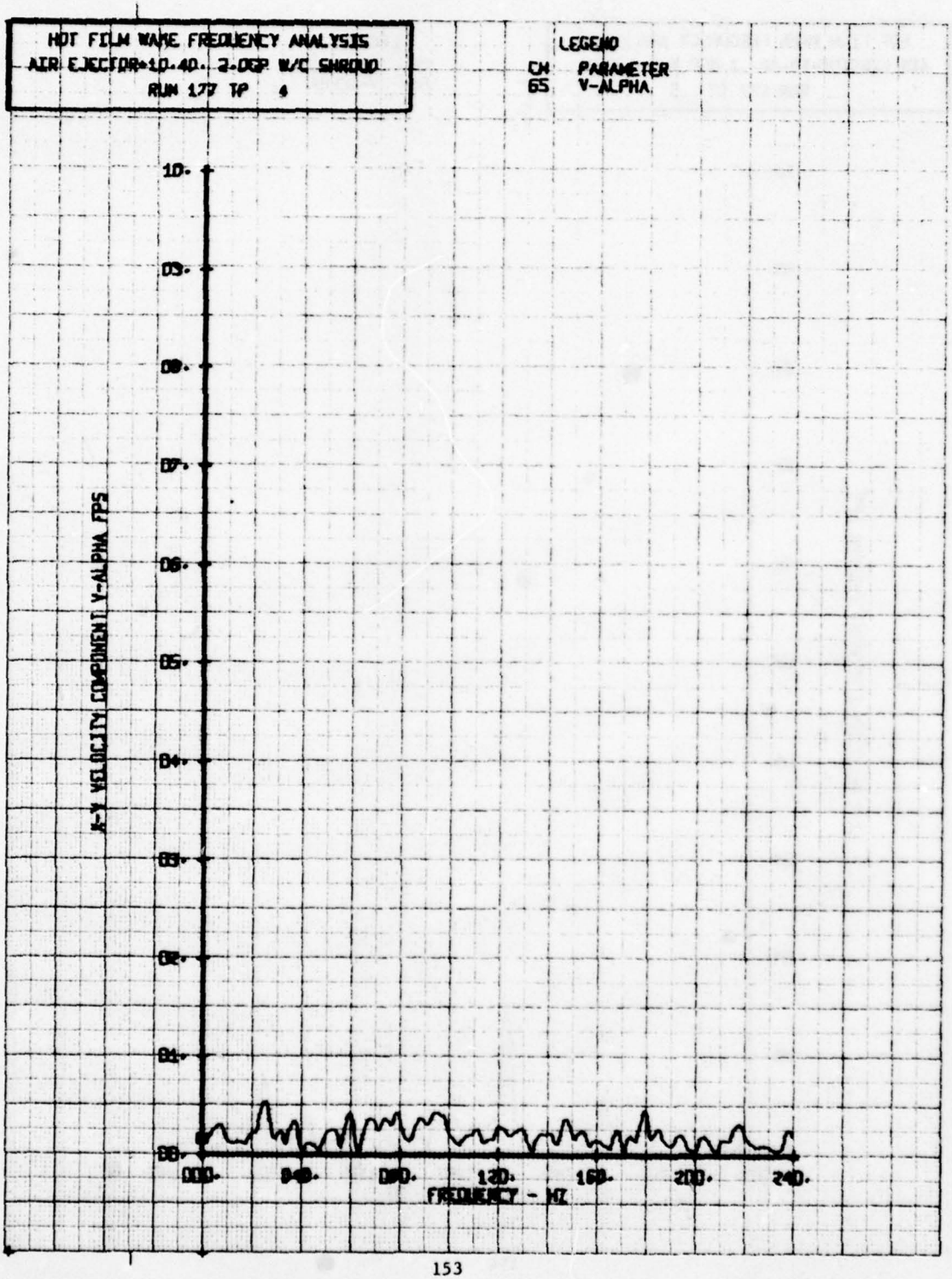
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR=10.40. 2-DEP W/C SHROUD
RUN 177 TP 4
LEGEND
CH PARAMETER
65 V-ALPHA
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J-A VELOCITY COMPONENT V-ALPHA FPS
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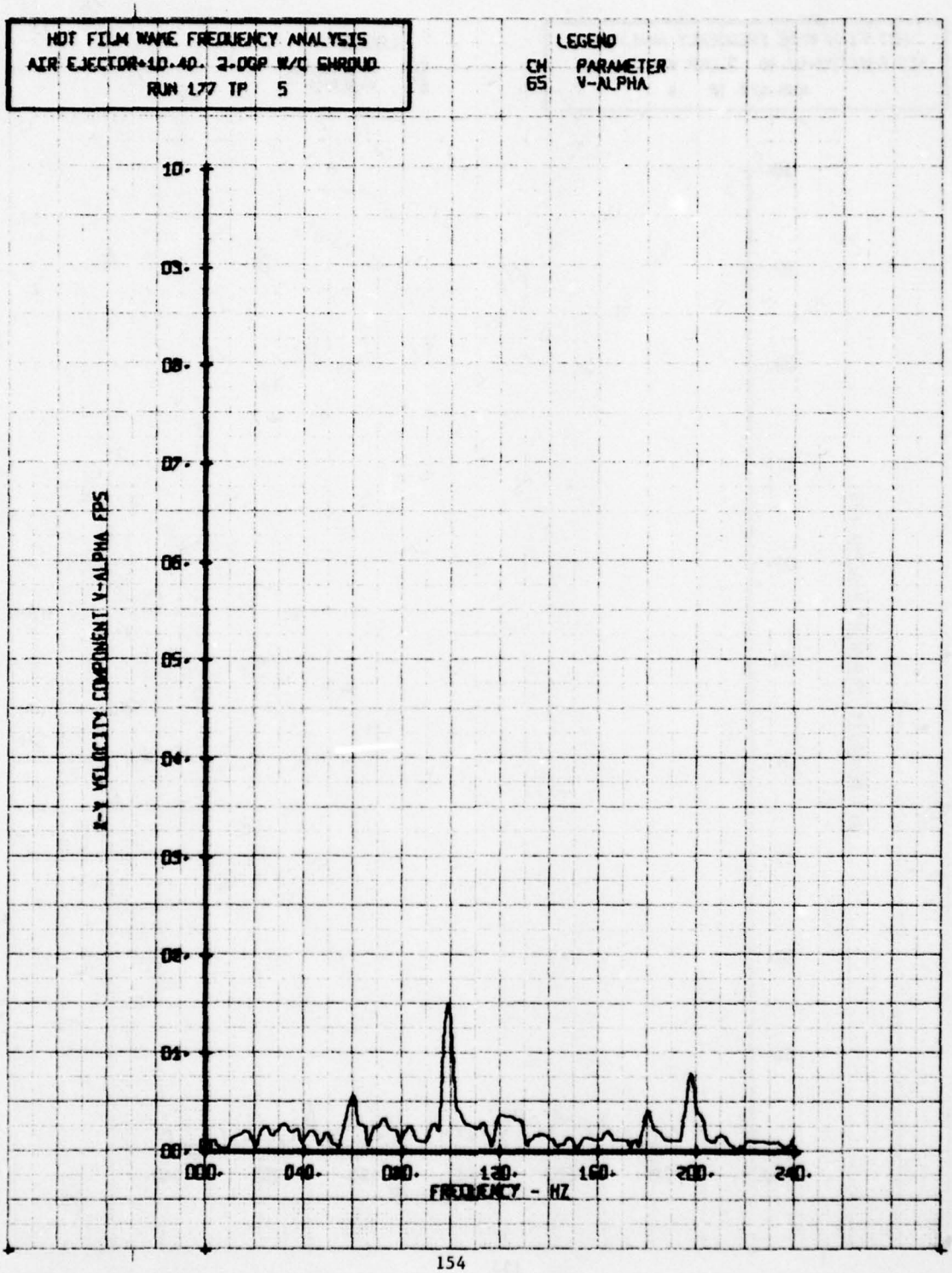
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+LD.40. 2-DOP W/O SHROUD
RUN 177 TP 5
LEGEND
CH PARAMETER
65 V-ALPHA
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R-V VELOCITY COMPONENT V-ALPHA FPS
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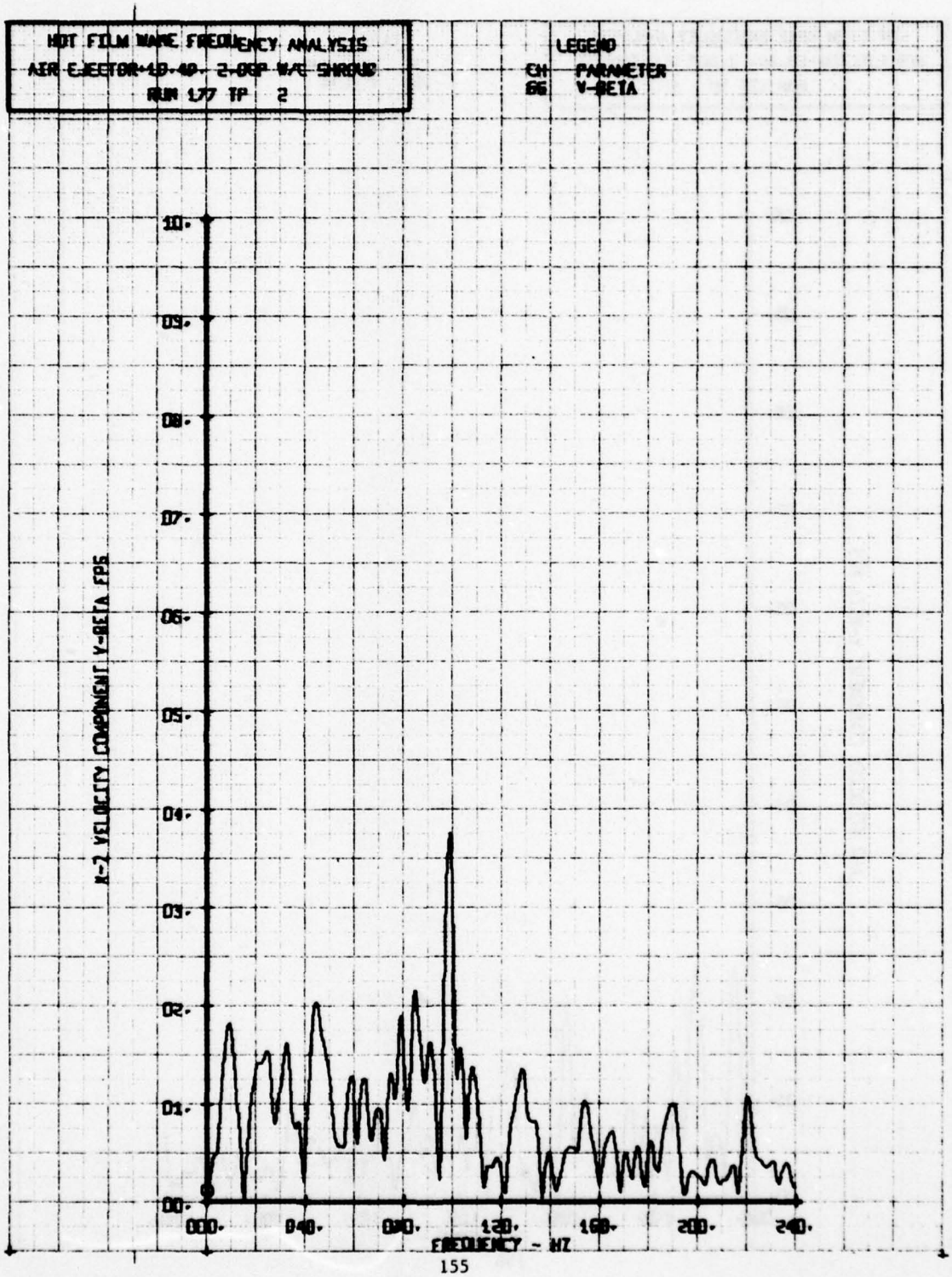
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR 40-40- 2-DEP W/C SHROUD
RUN 177 TP 2
LEGEND
CH PARAMETER
06 V-BETA
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X-2 VELOCITY COMPONENT V-BETA FPS
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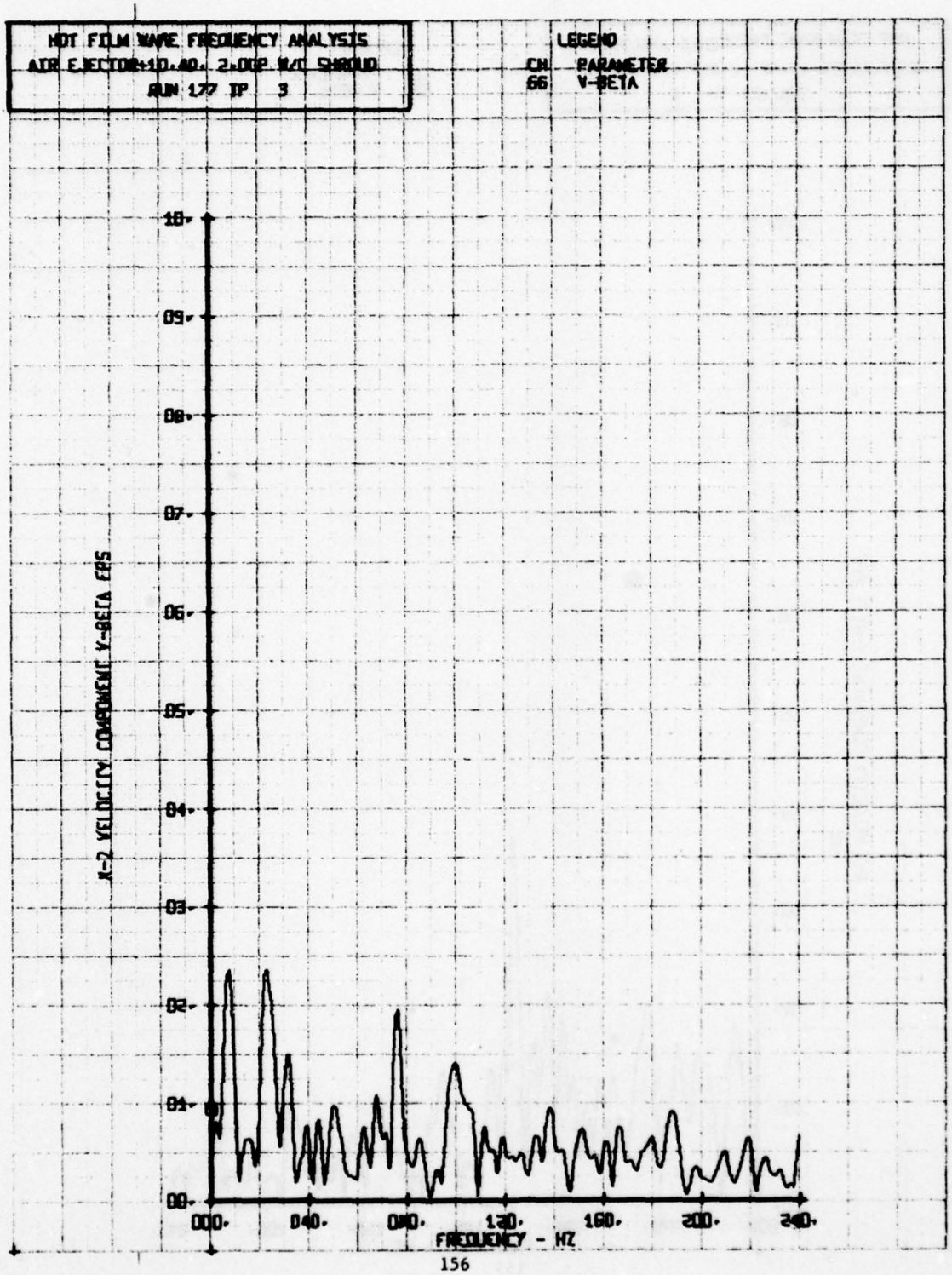
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR=10.40. 2.00P W/O SHROUD
RUN 177 TP 3
LEGEND
CH PARAMETER
66 V-BETA
X-2 VELOCITY COMPONENT V-BETA EPS
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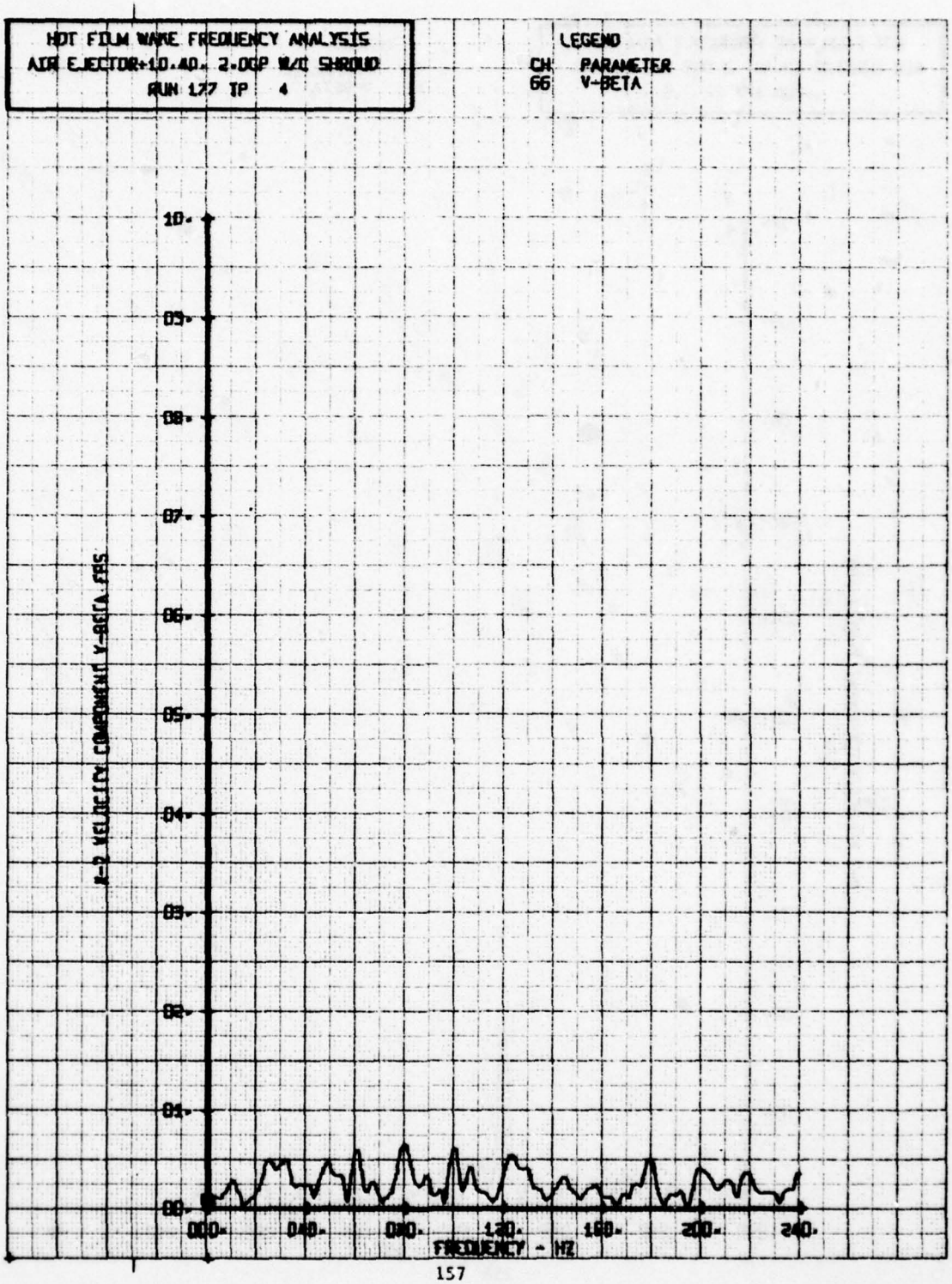
240.
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+1.0.40.+ 2.00P W/O SHROUD
RUN 177 TP 4
LEGEND
CH PARAMETER
66 V-BETA
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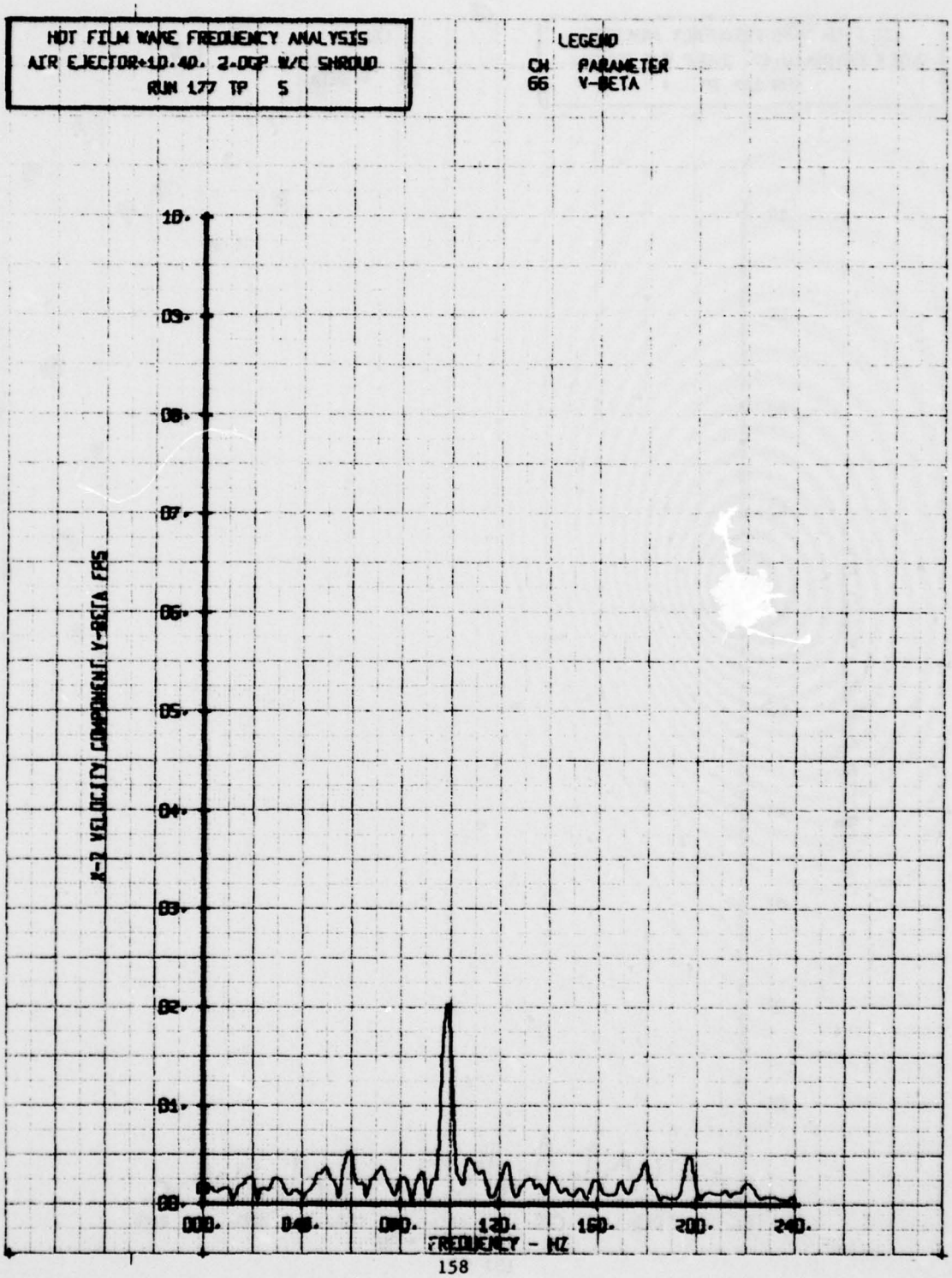
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
AIR EJECTOR+10.40. 2-DGP W/C SHROUD
RUN 177 TP 5
LEGEND
CH PARAMETER
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X-2 VELOCITY COMPONENT V-BETA FPS
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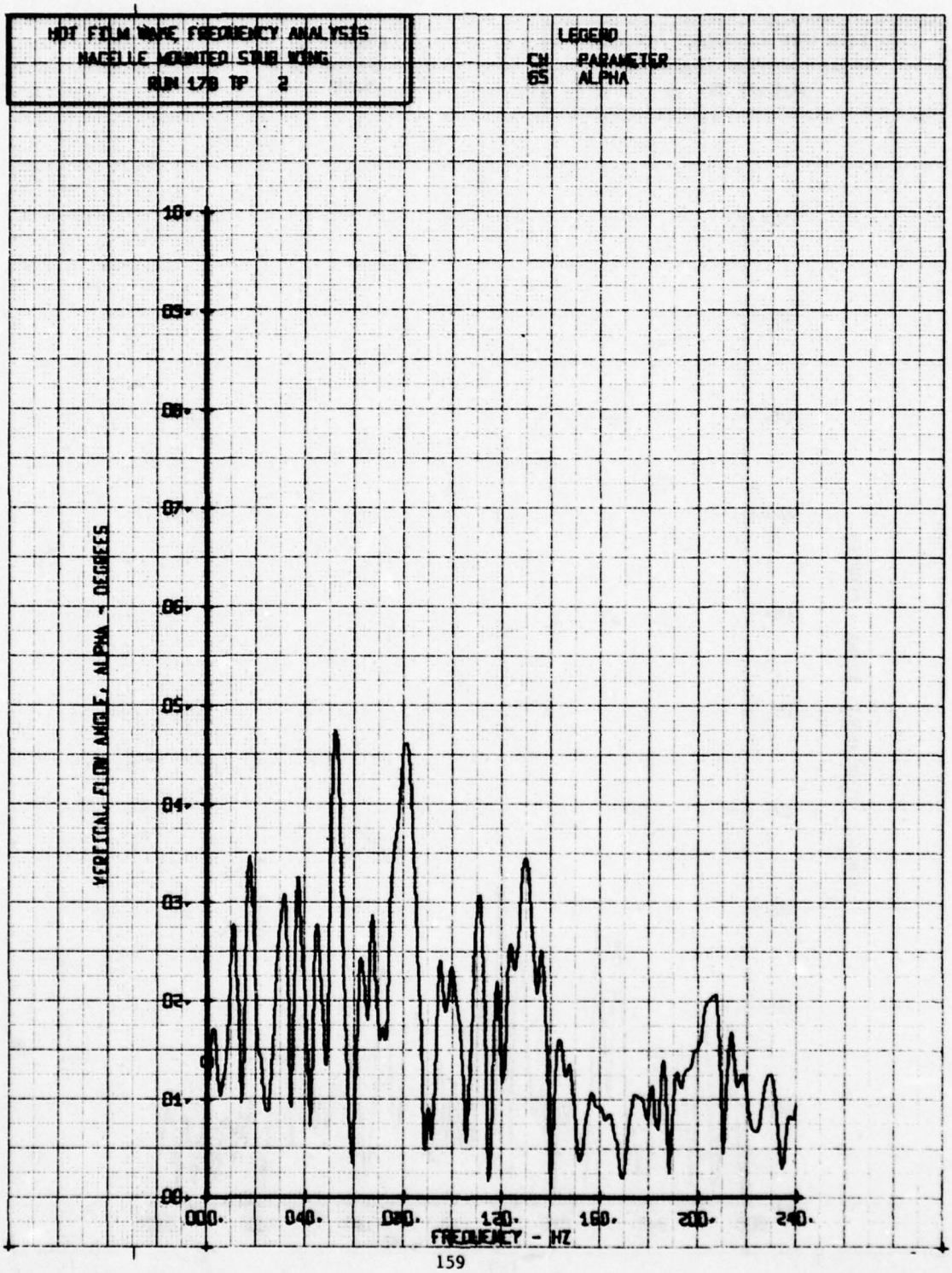
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 2
LEGEND
CH PARAMETER
65 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ
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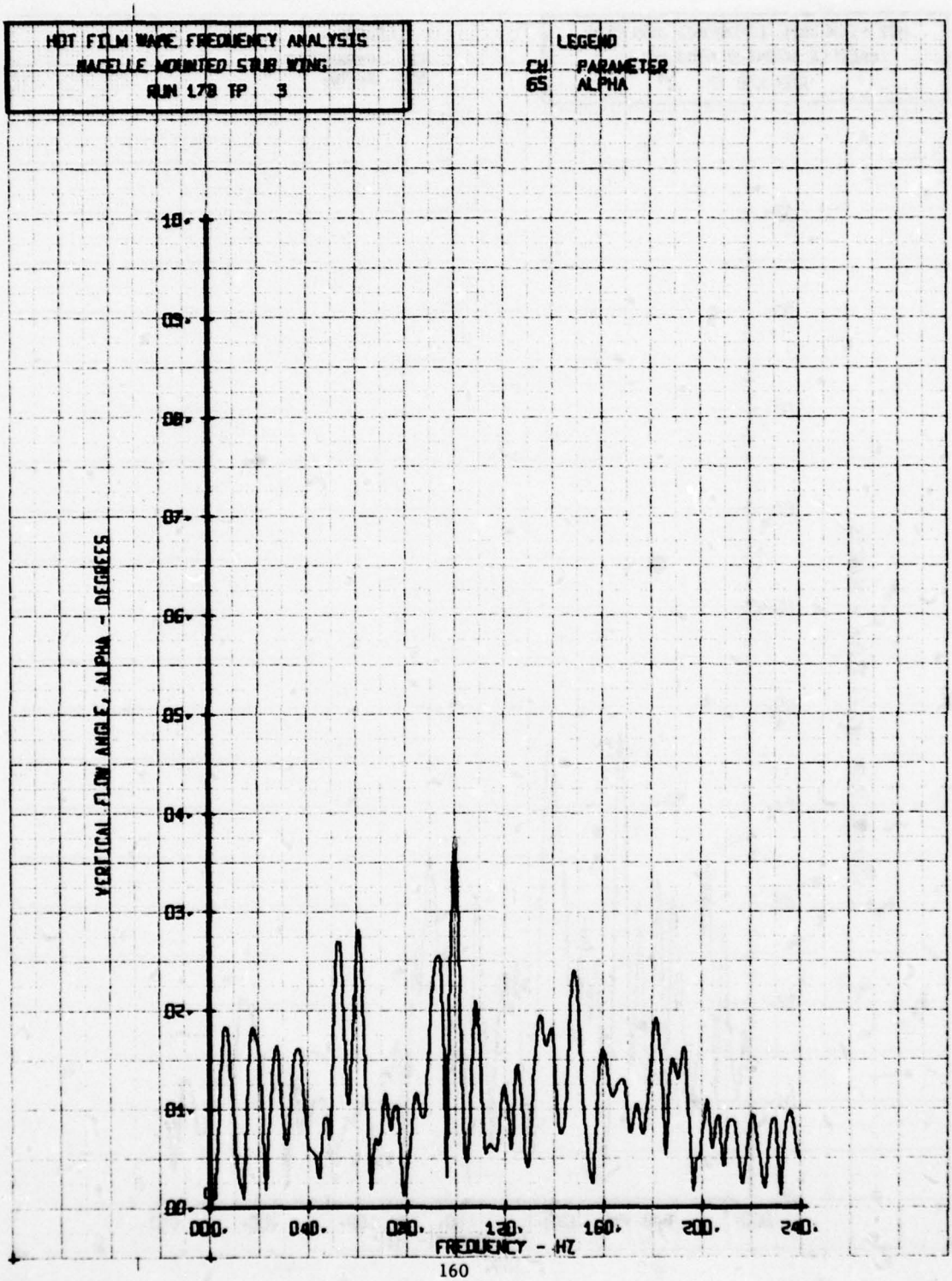
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 3
LEGEND
CH PARAMETER
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ
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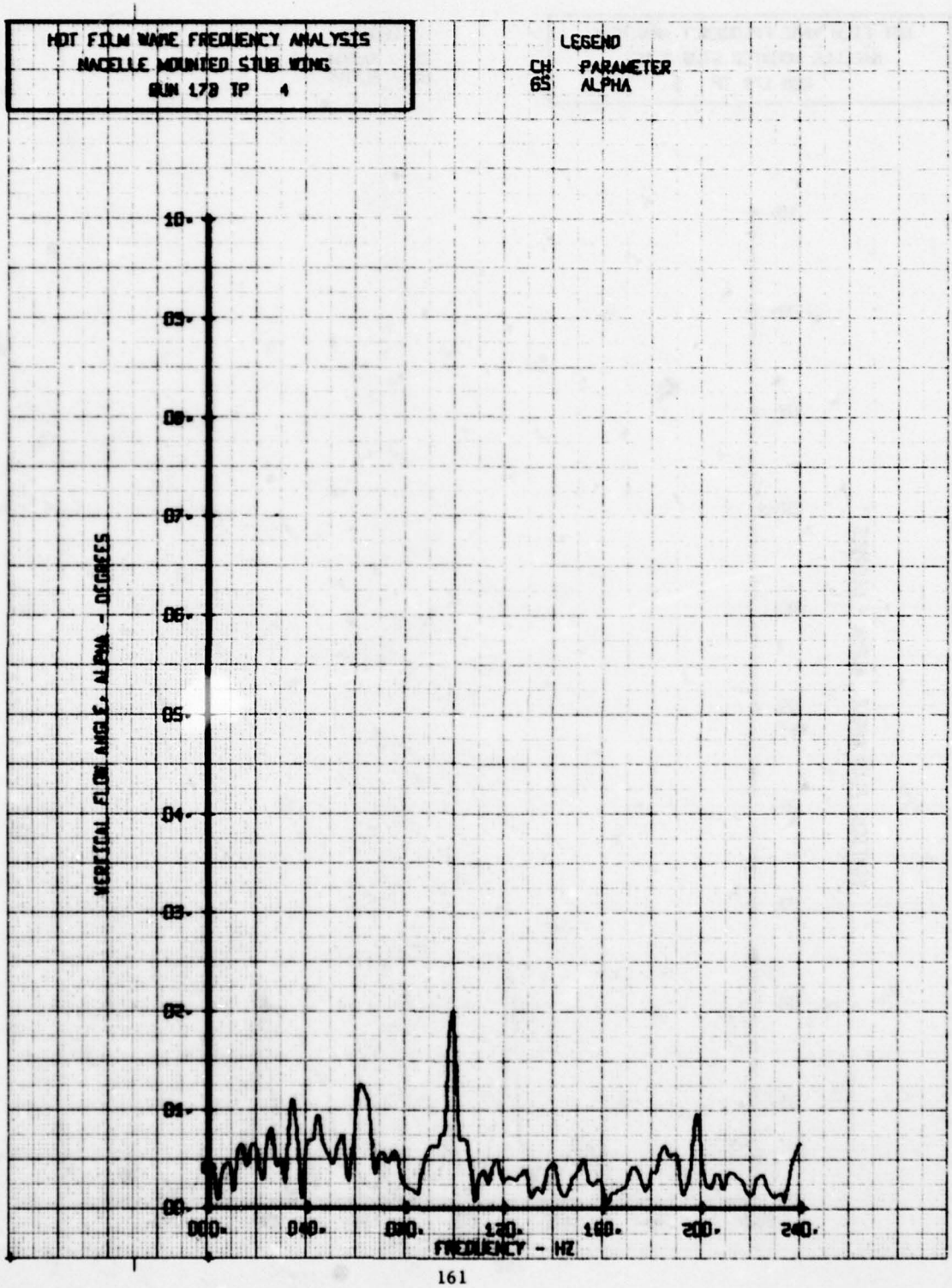
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 4
LEGEND
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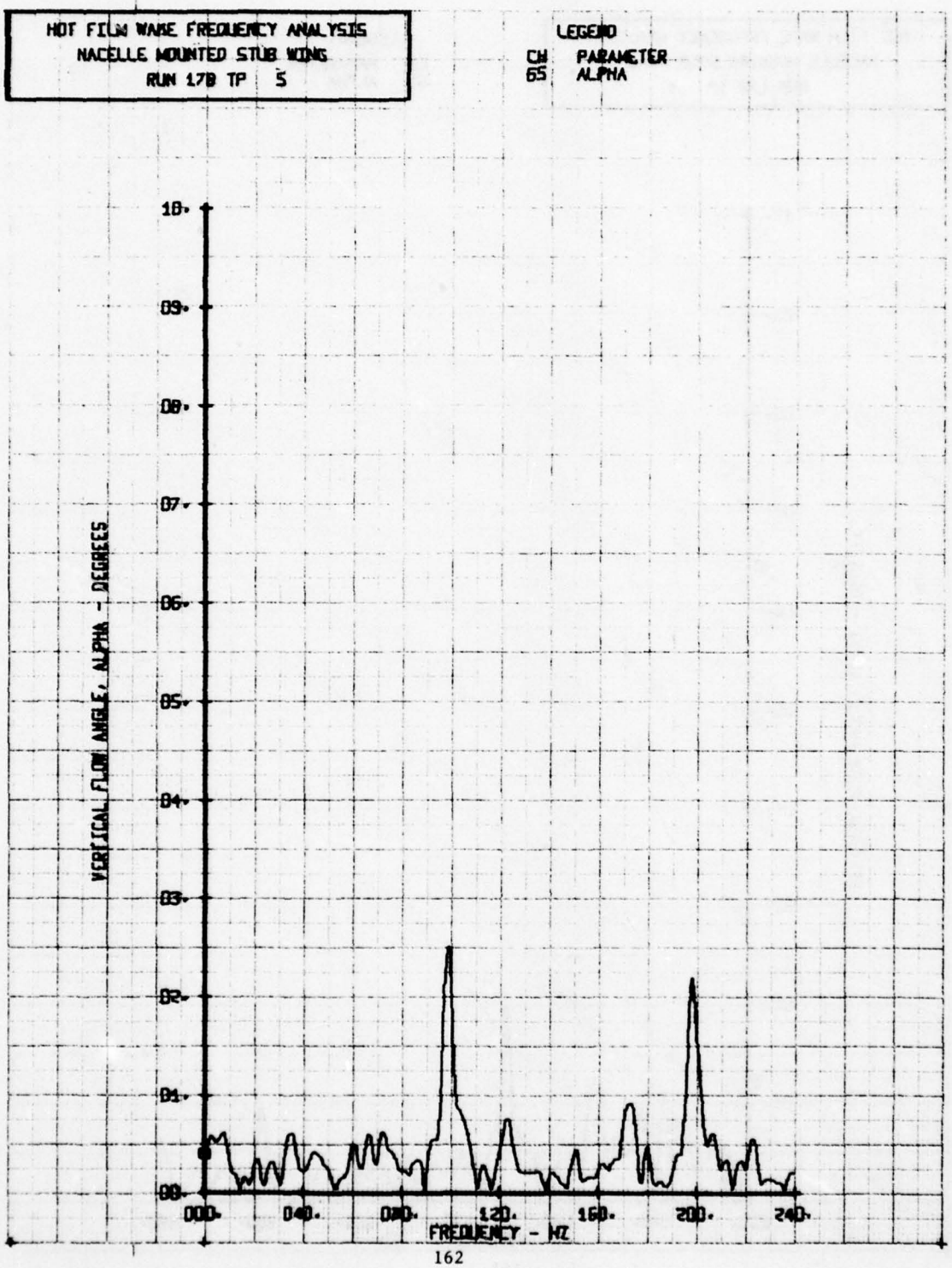
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 5
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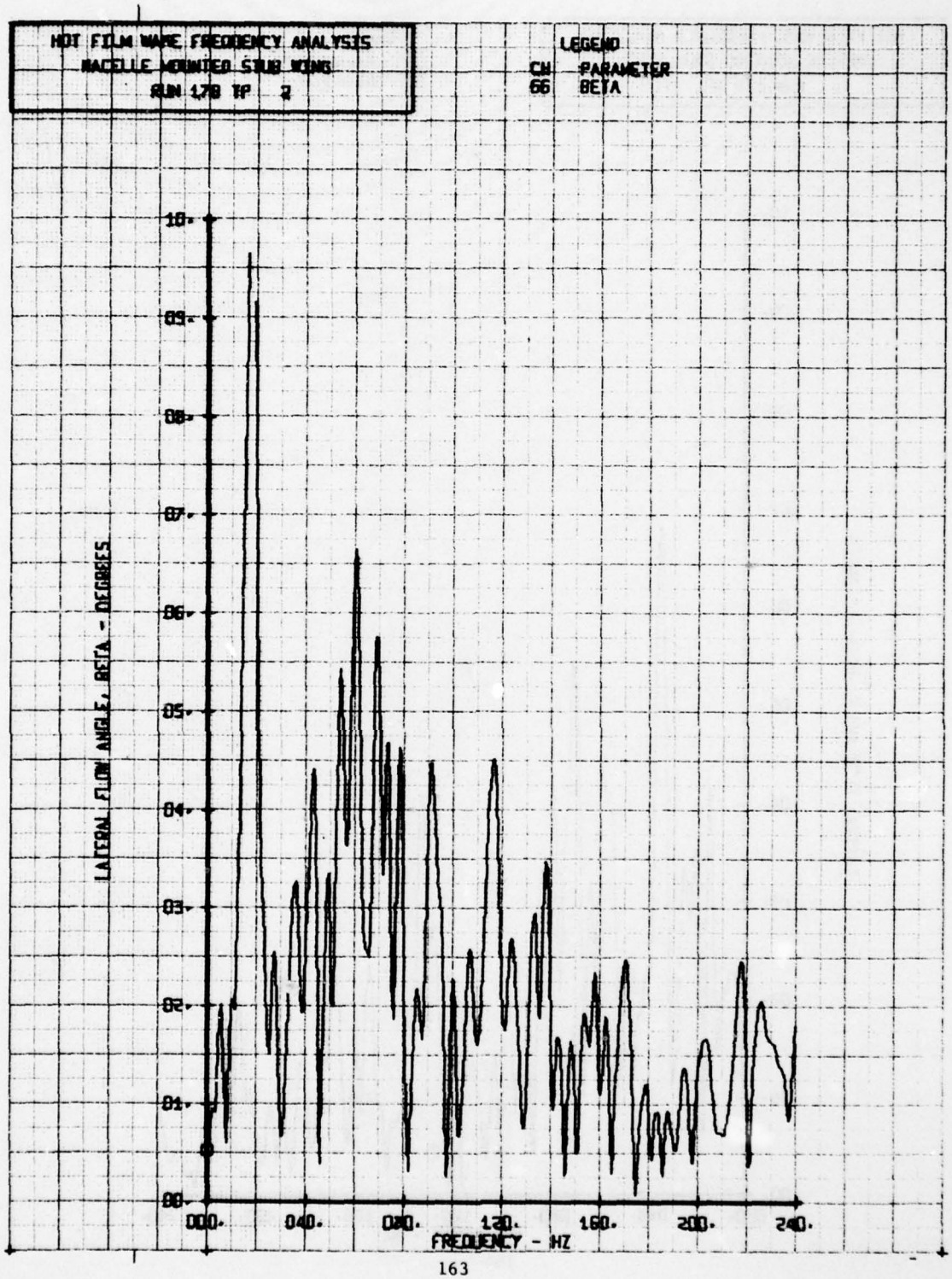
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 2
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CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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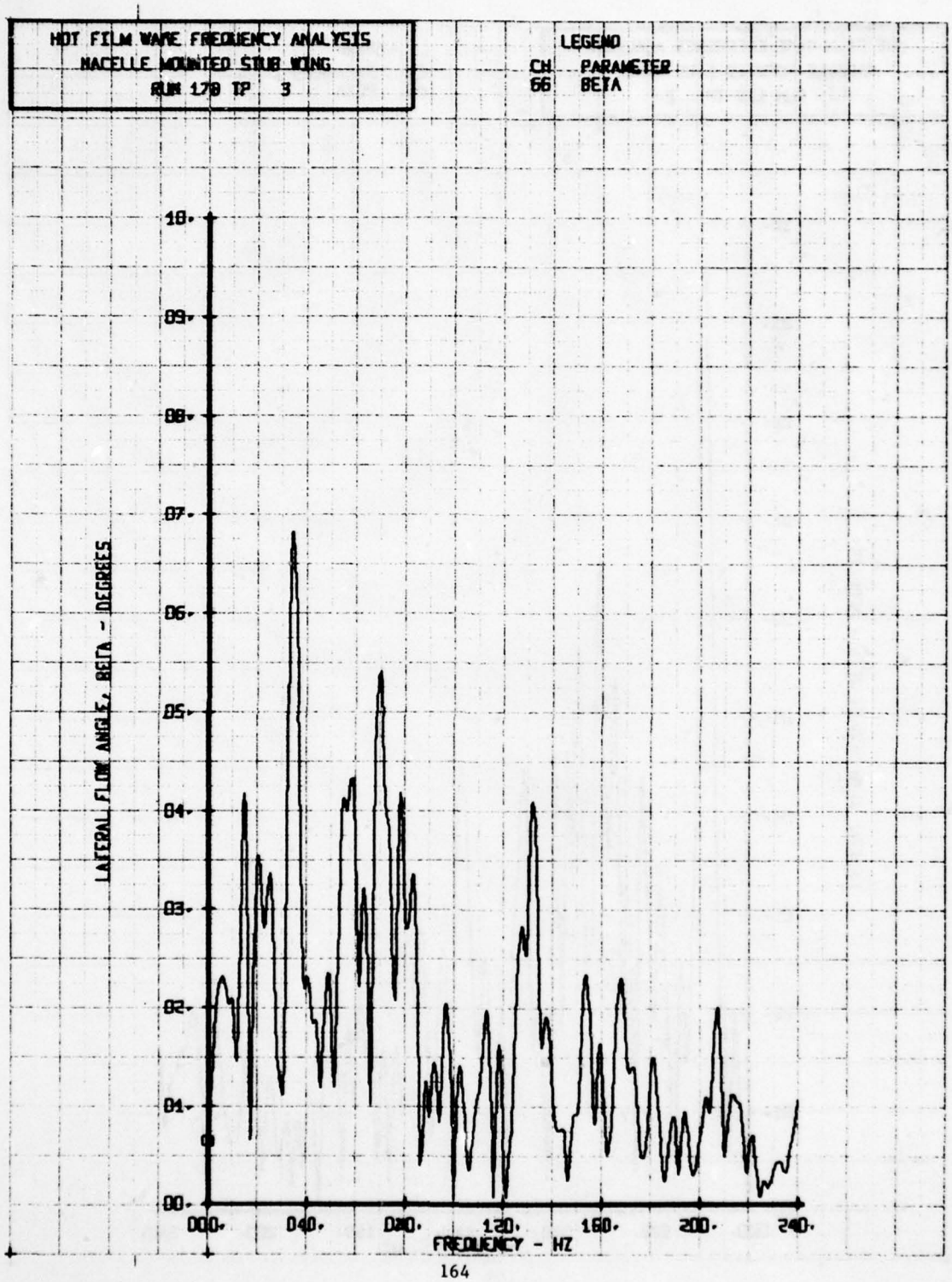
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 170 TP 3
LEGEND
CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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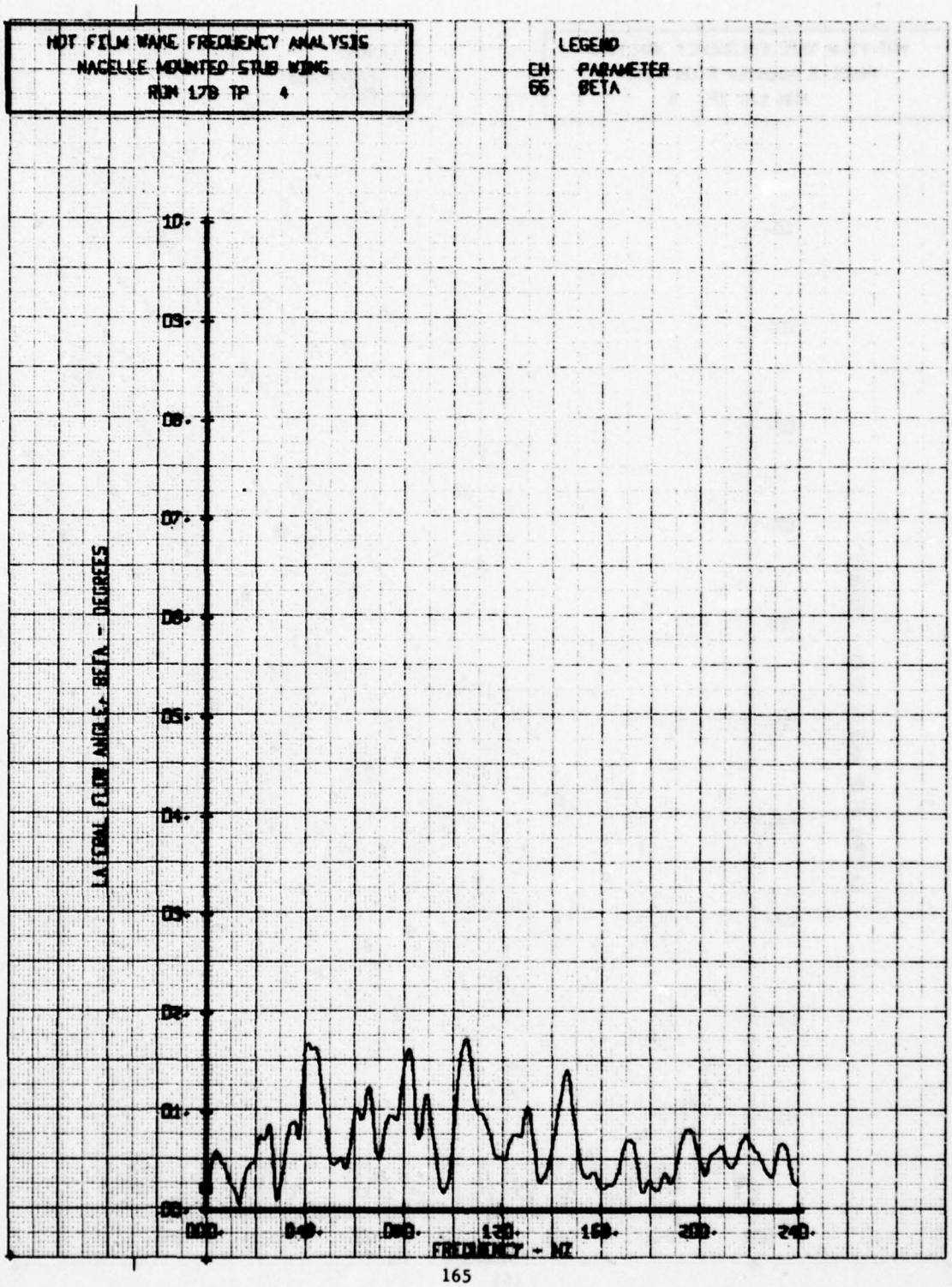
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 4
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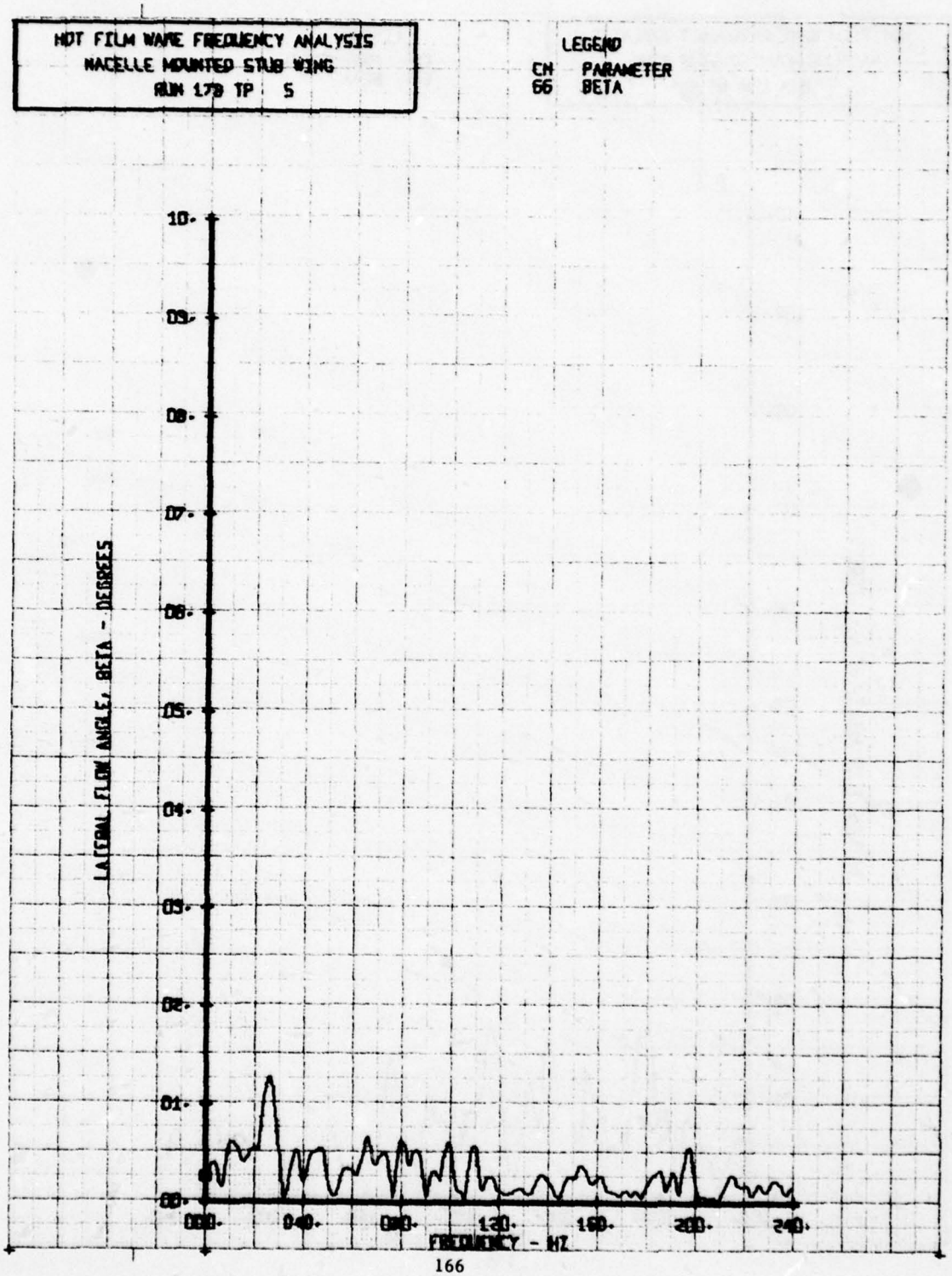
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 5
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LATERAL FLOW ANGLE, BETA - DEGREES
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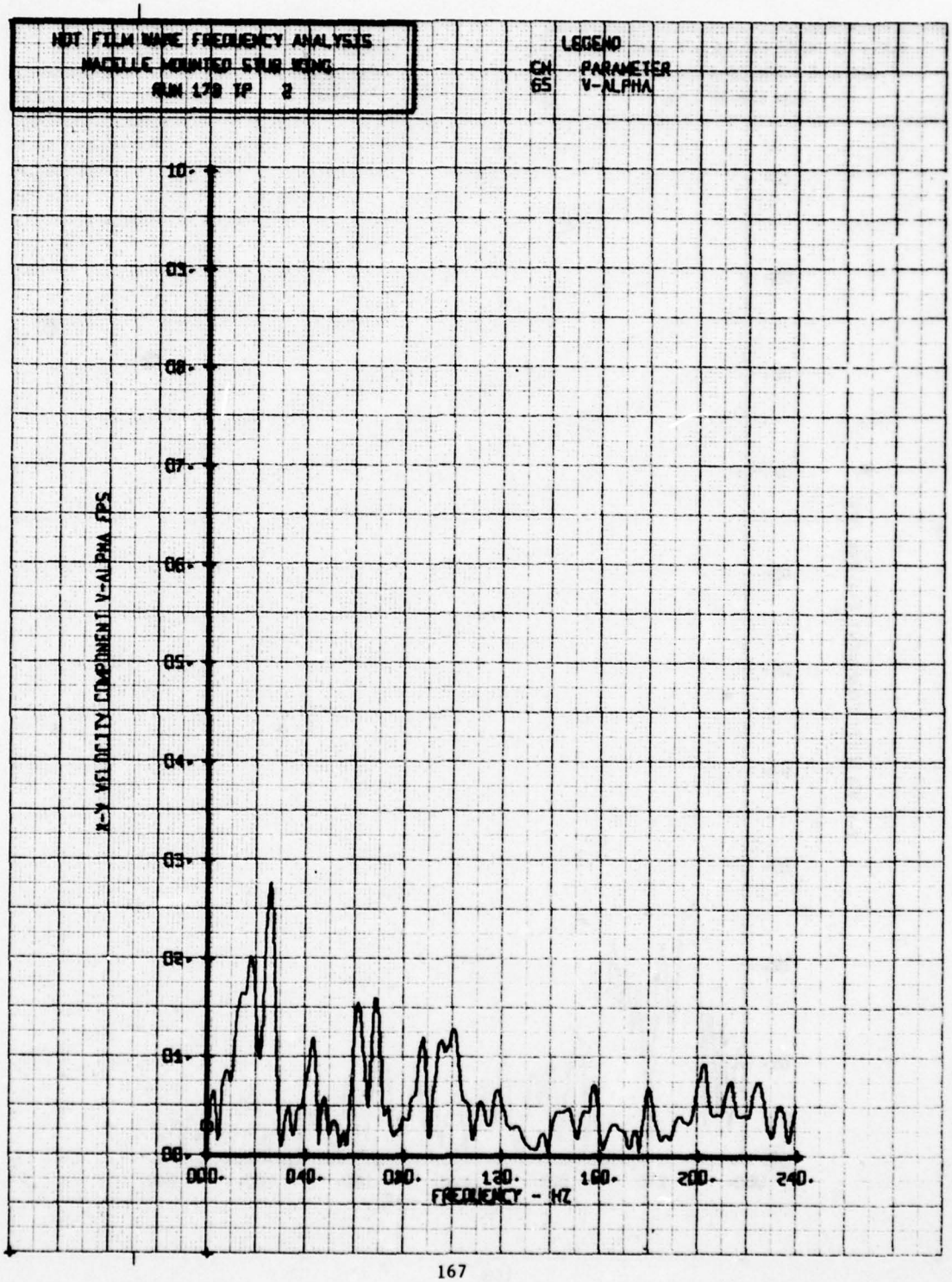
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 2
LEGEND
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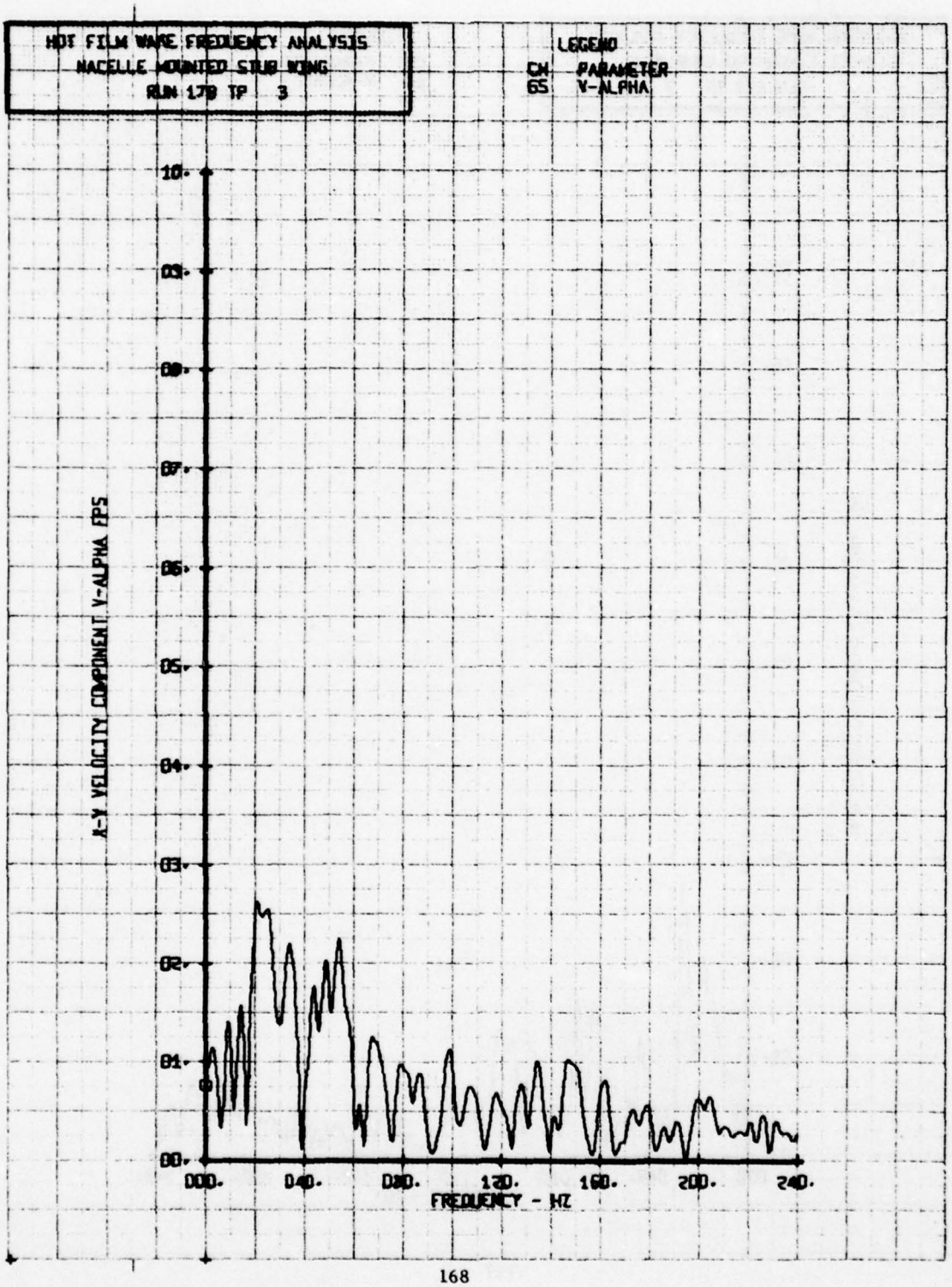
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 3
LEGEND
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A-V VELOCITY COMPONENT V-ALPHA FPS
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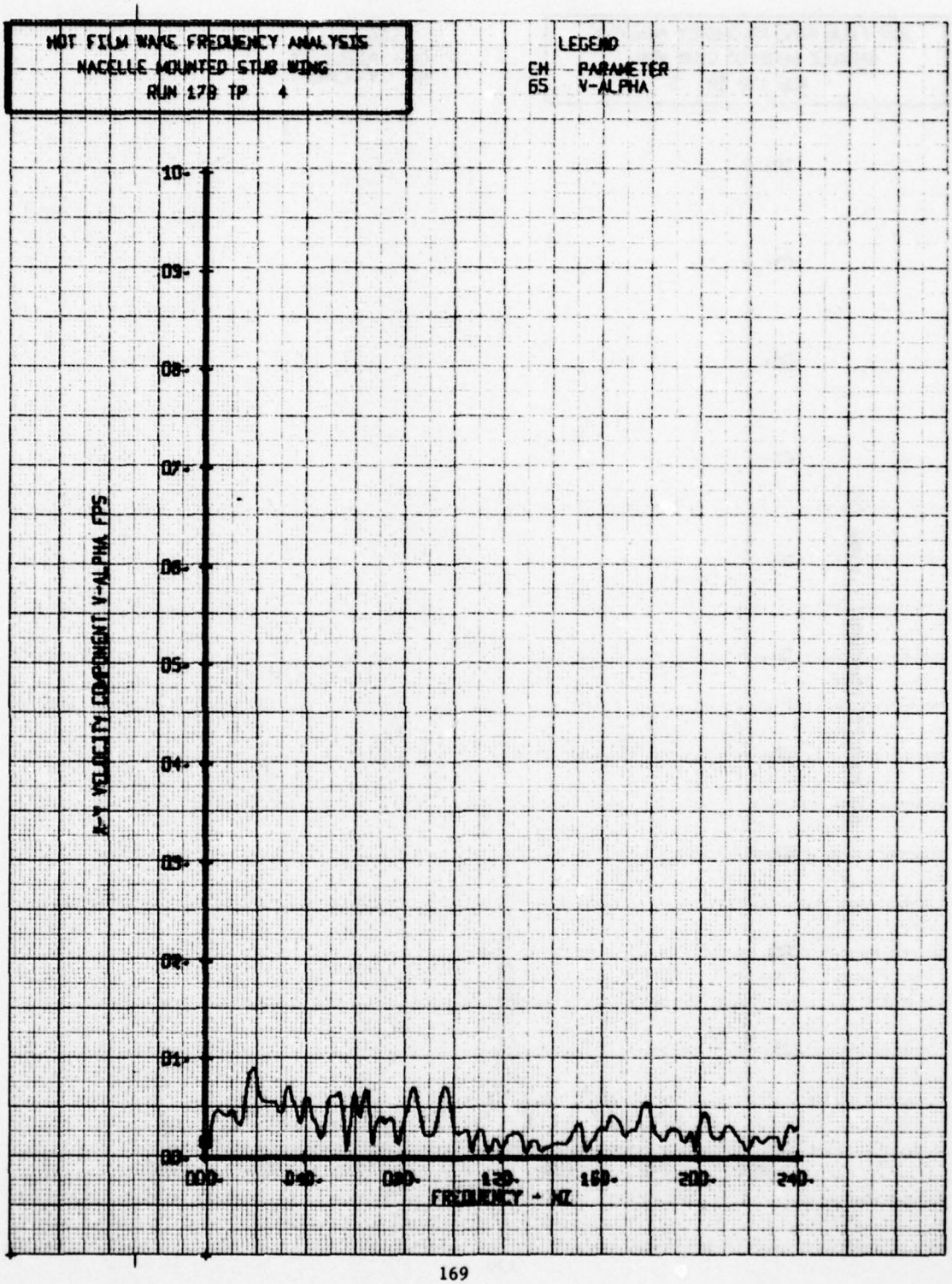
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 4
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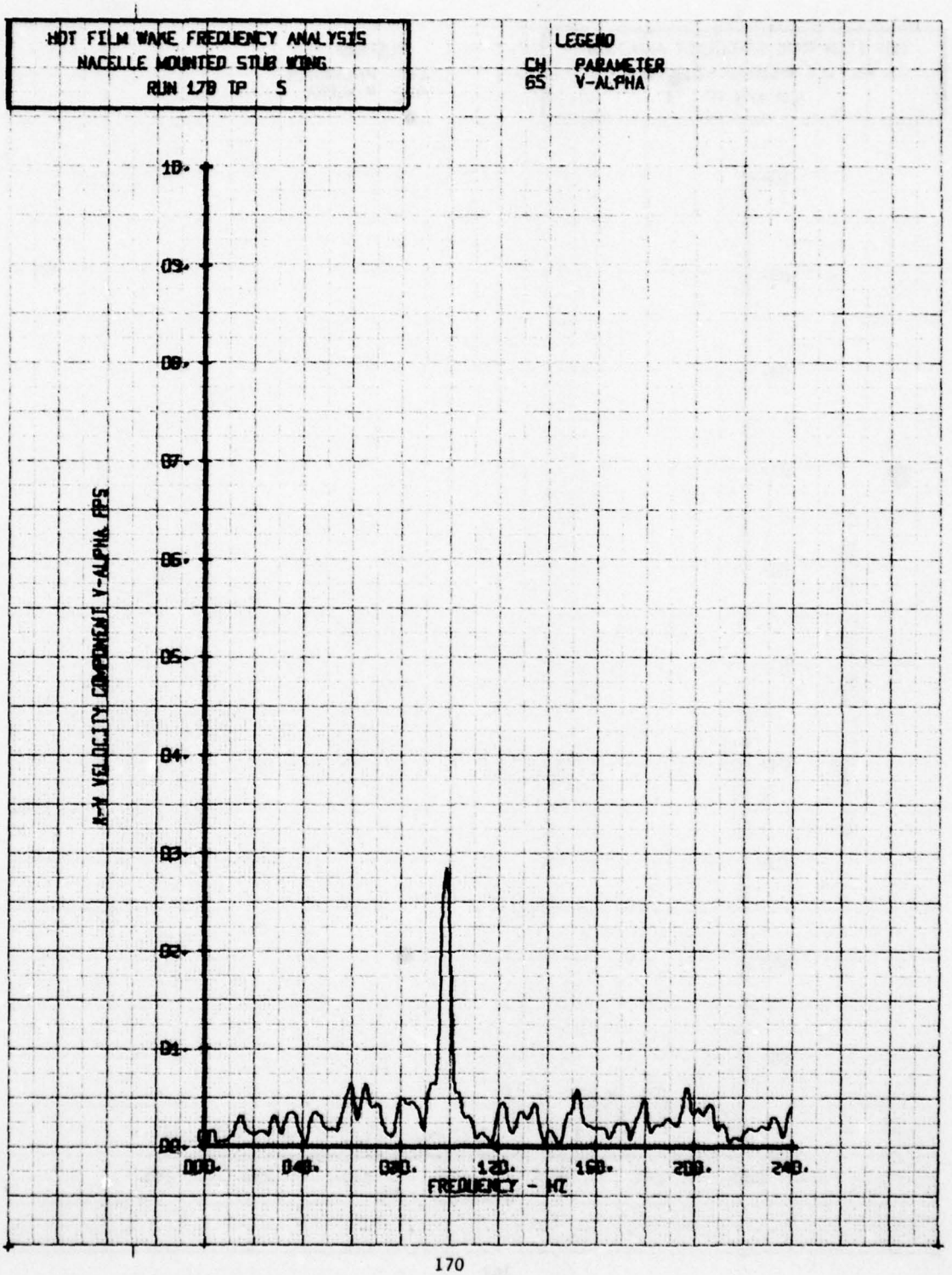
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 5
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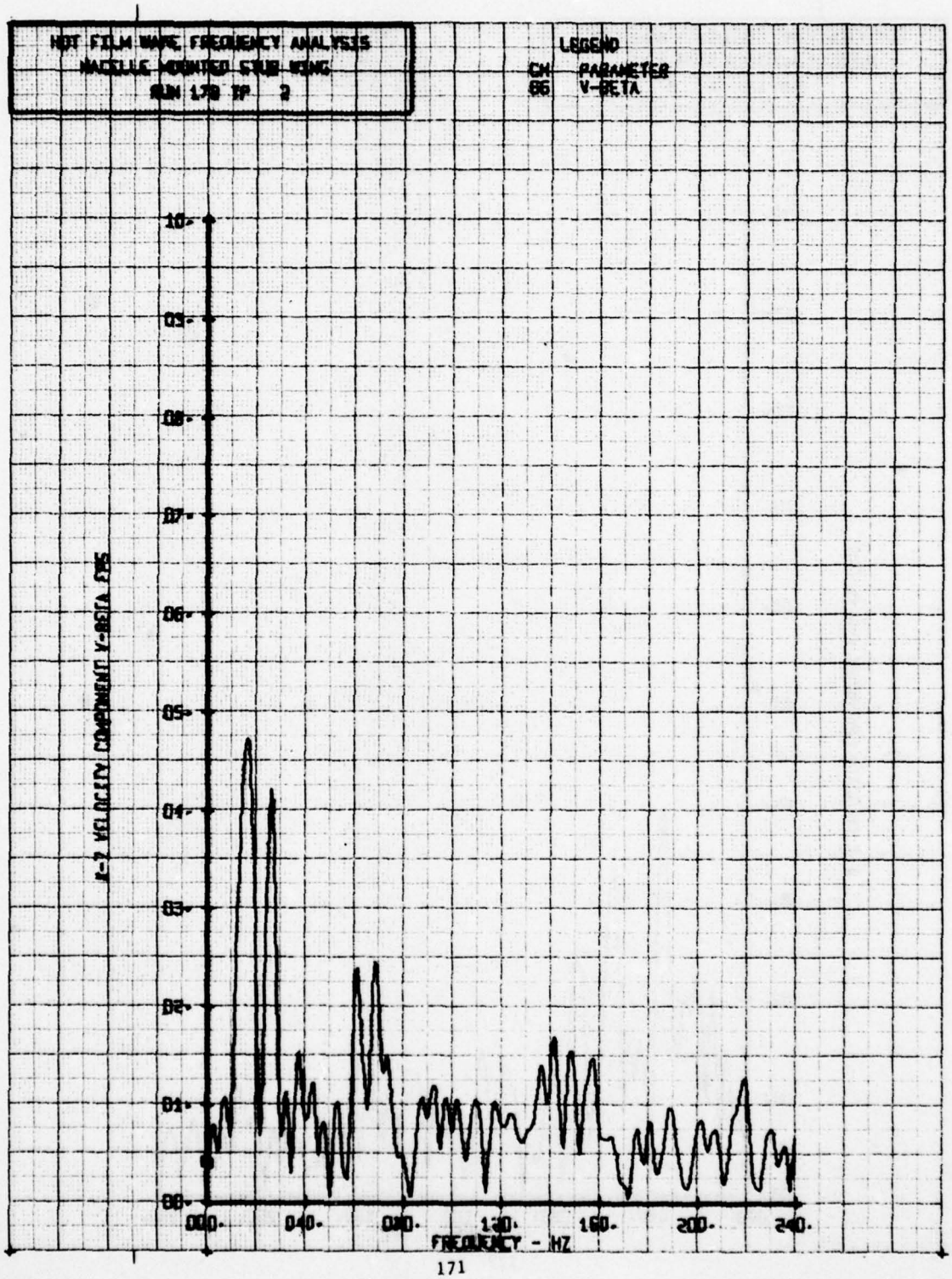
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 2
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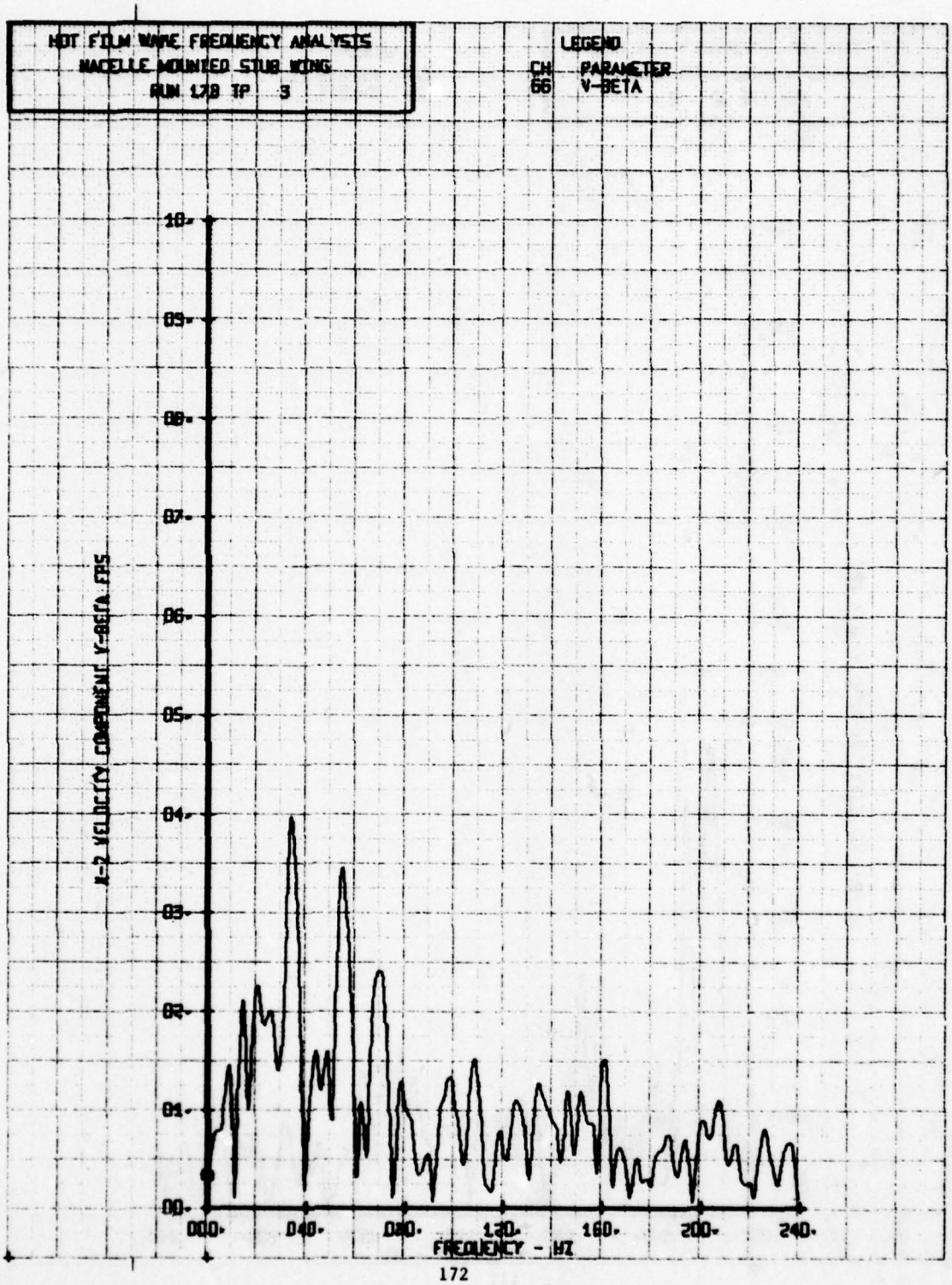
SQ V-BETA COMPONENT V-BETA CMS


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 3
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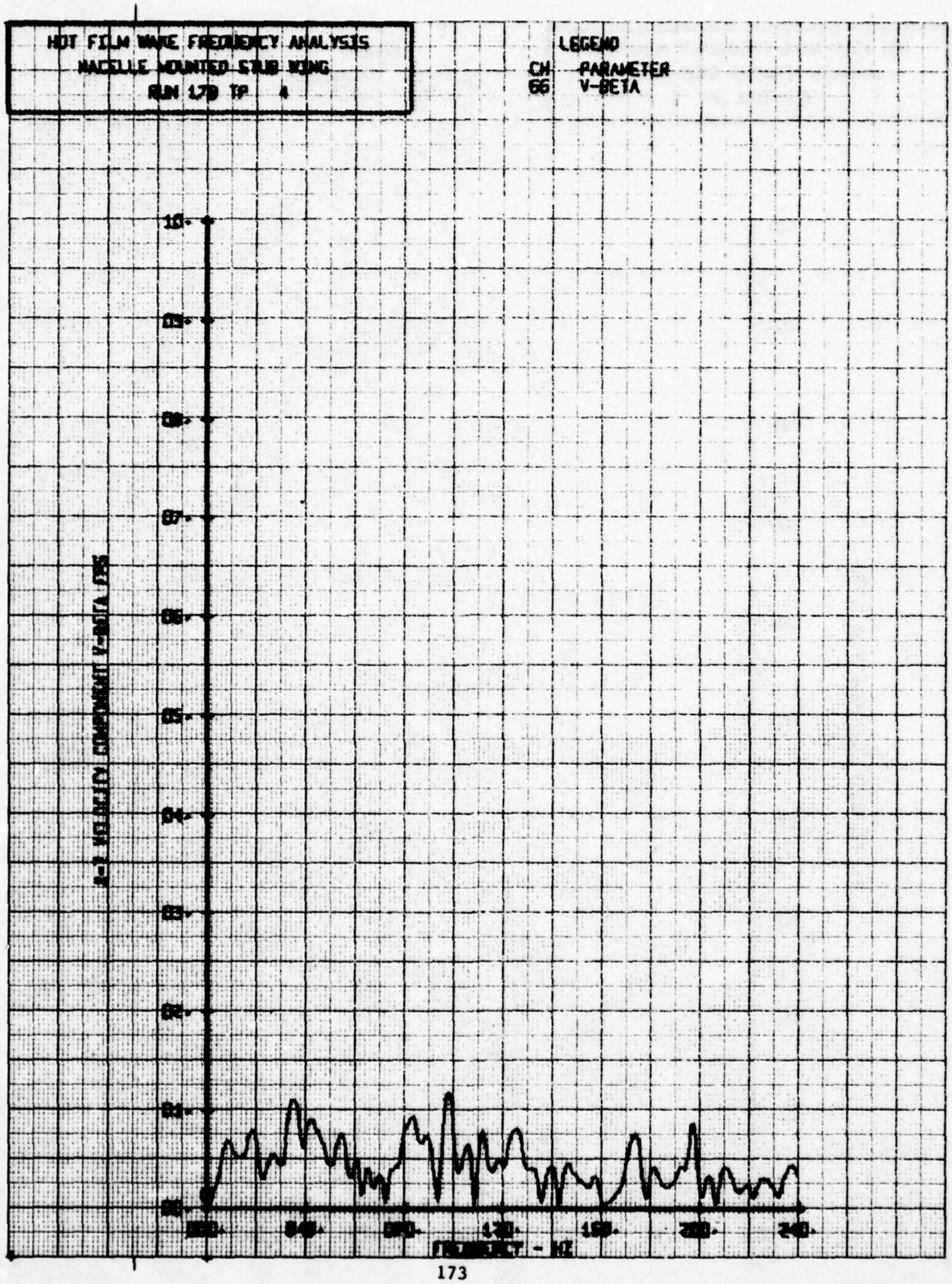
HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 179 TP 4
LEGEND
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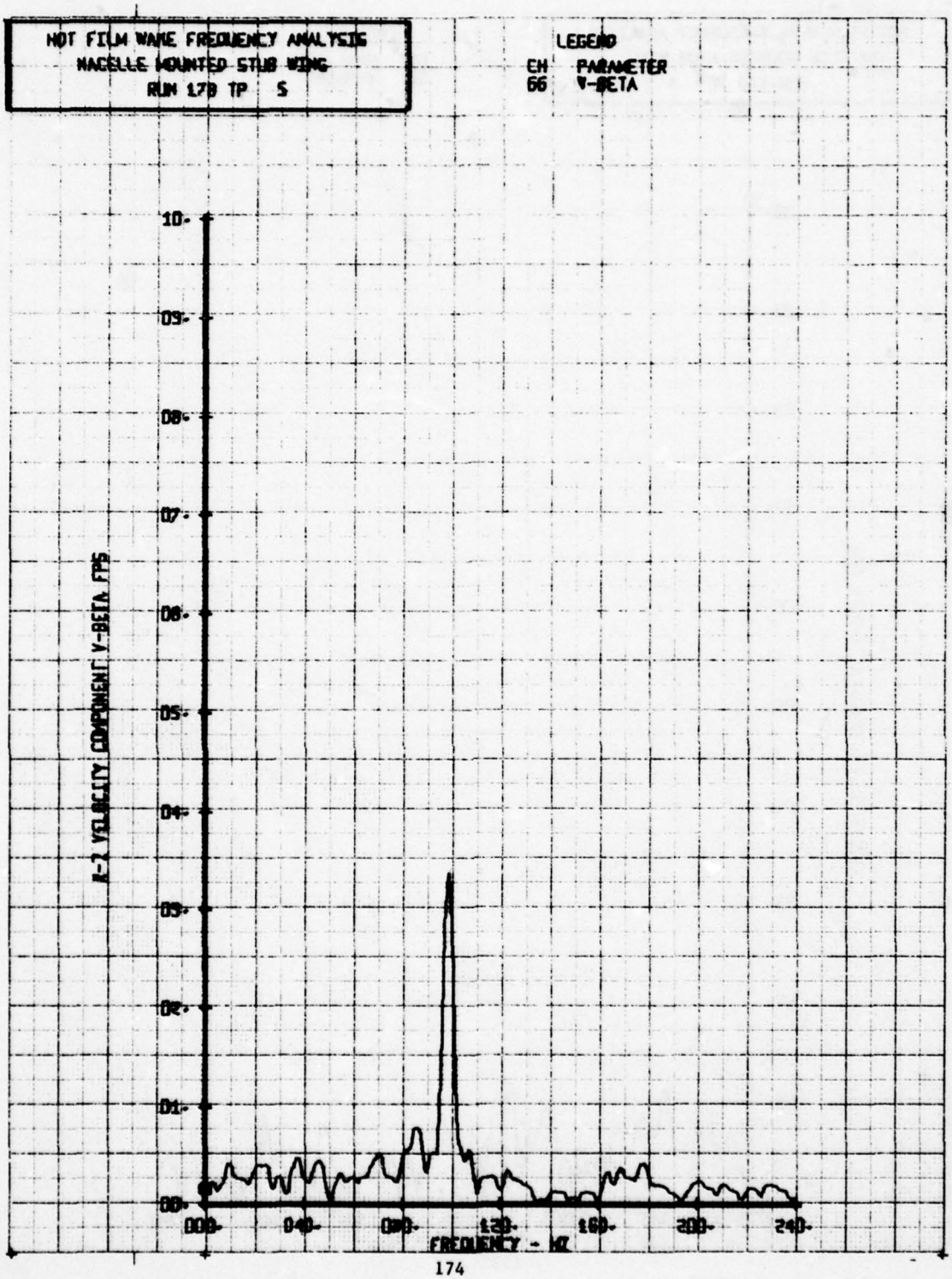
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
NACELLE MOUNTED STUB WING
RUN 178 TP 5
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A-2 VELOCITY COMPONENT V-BETA FPS
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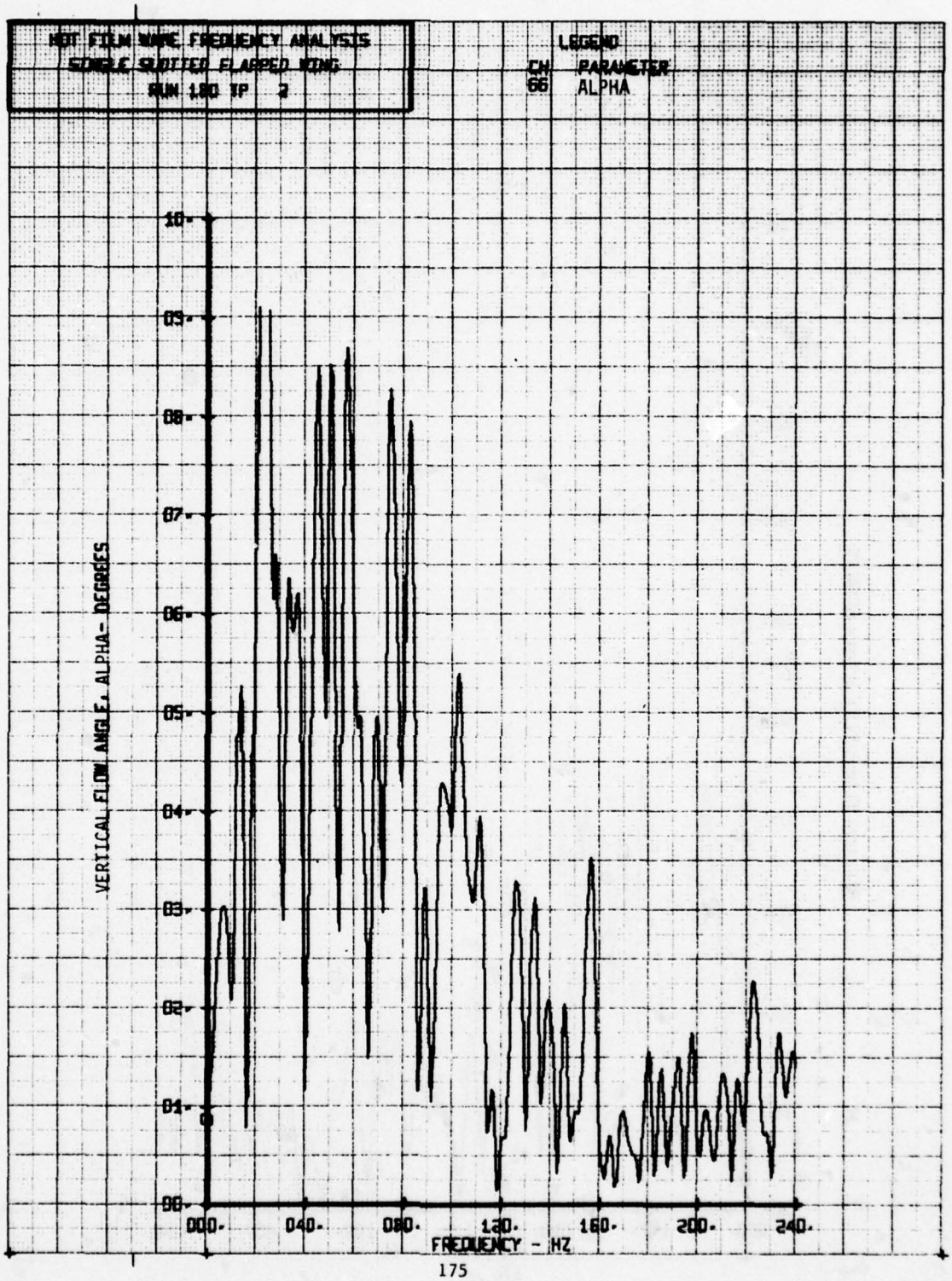
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 2
LEGEND
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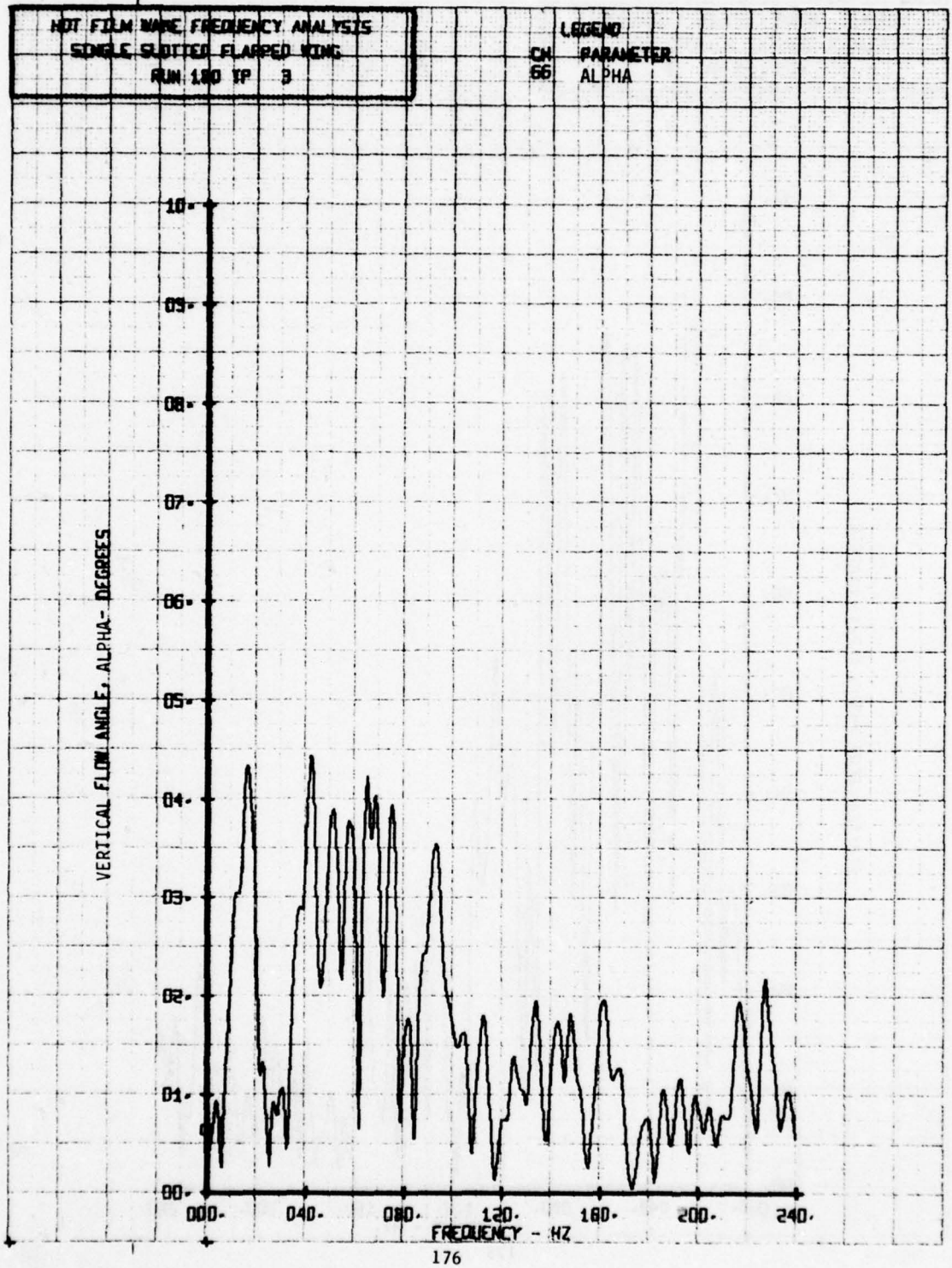
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 3
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VERTICAL FLOW ANGLE, ALPHA- DEGREES
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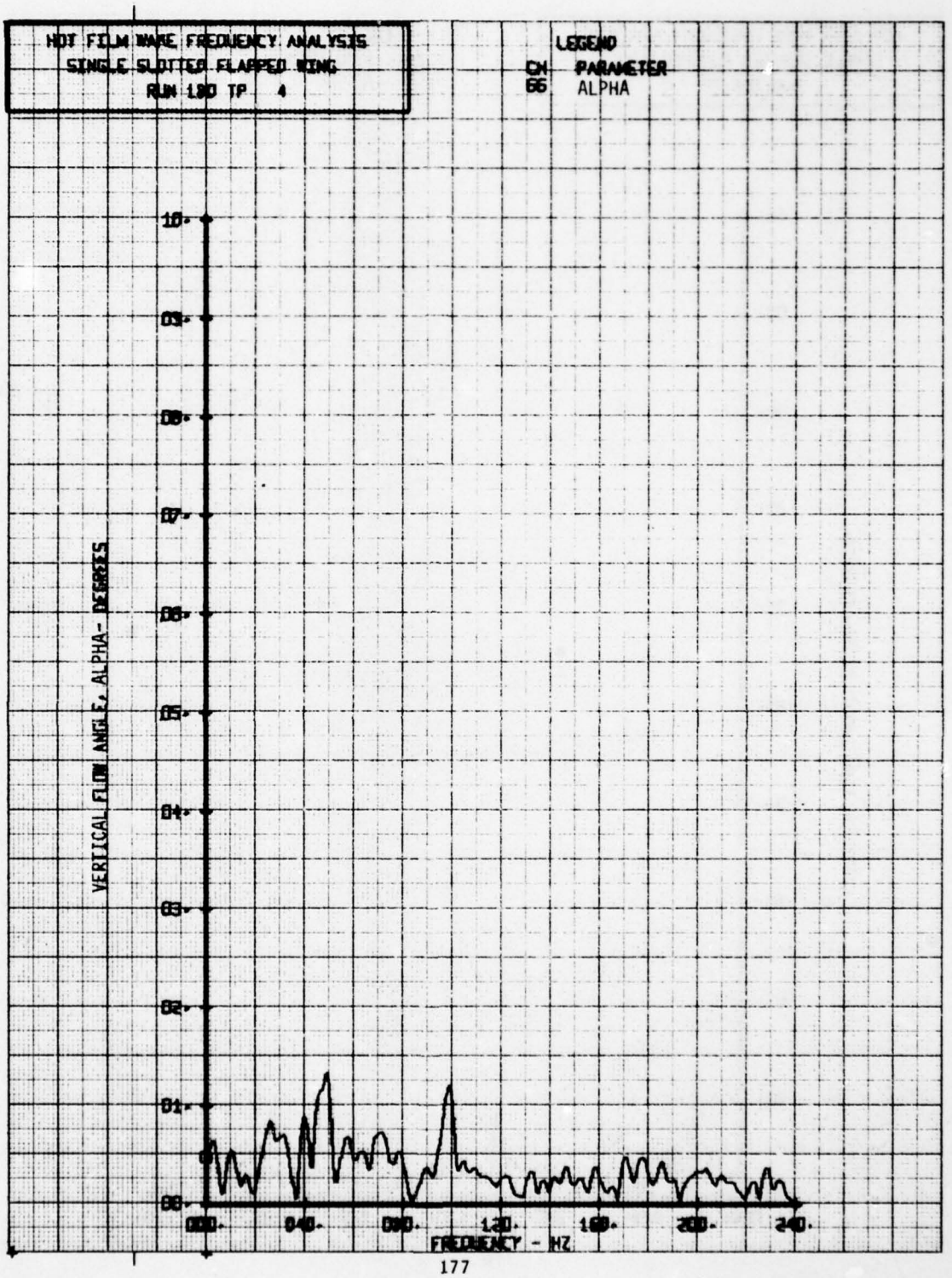
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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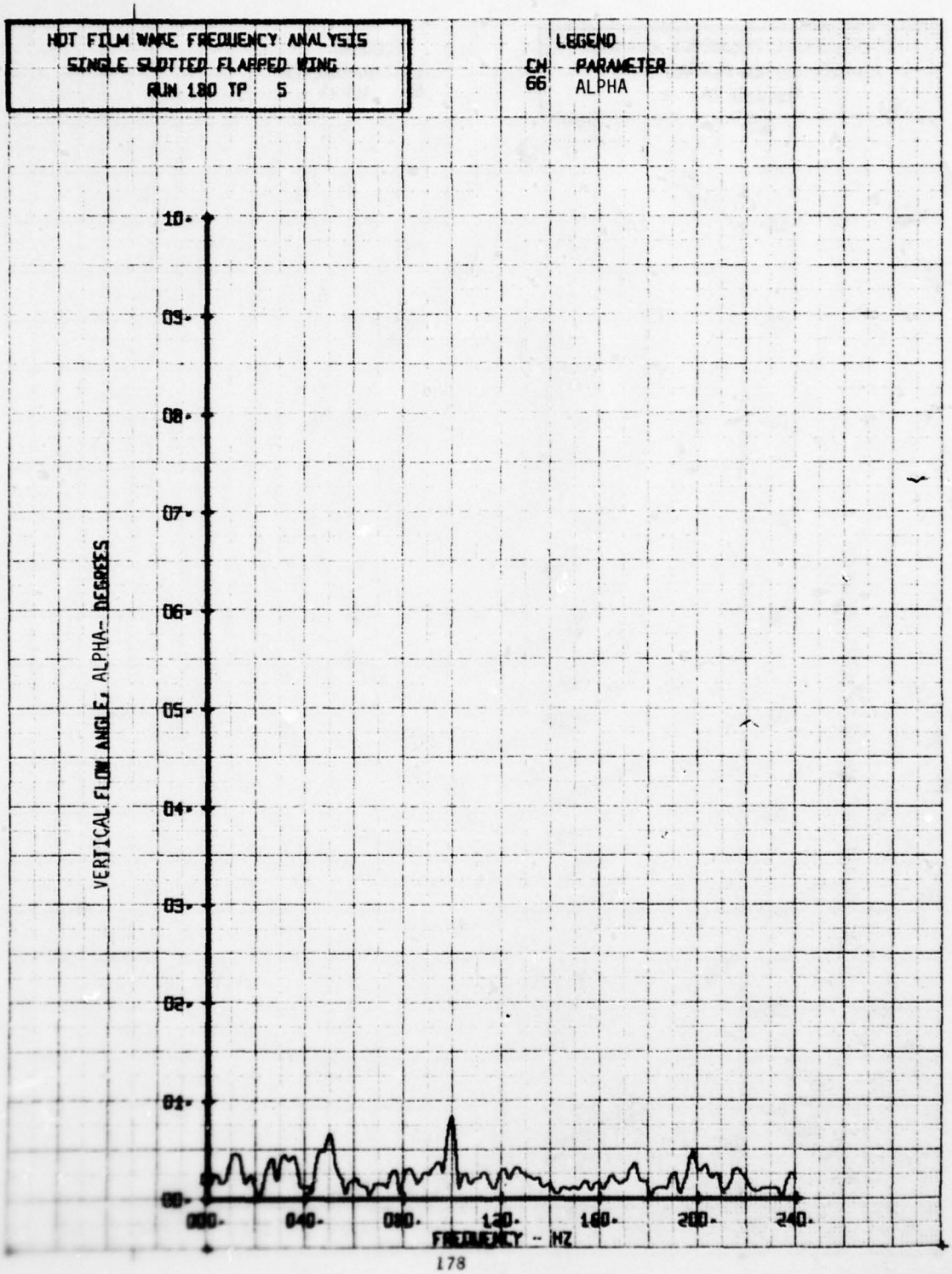
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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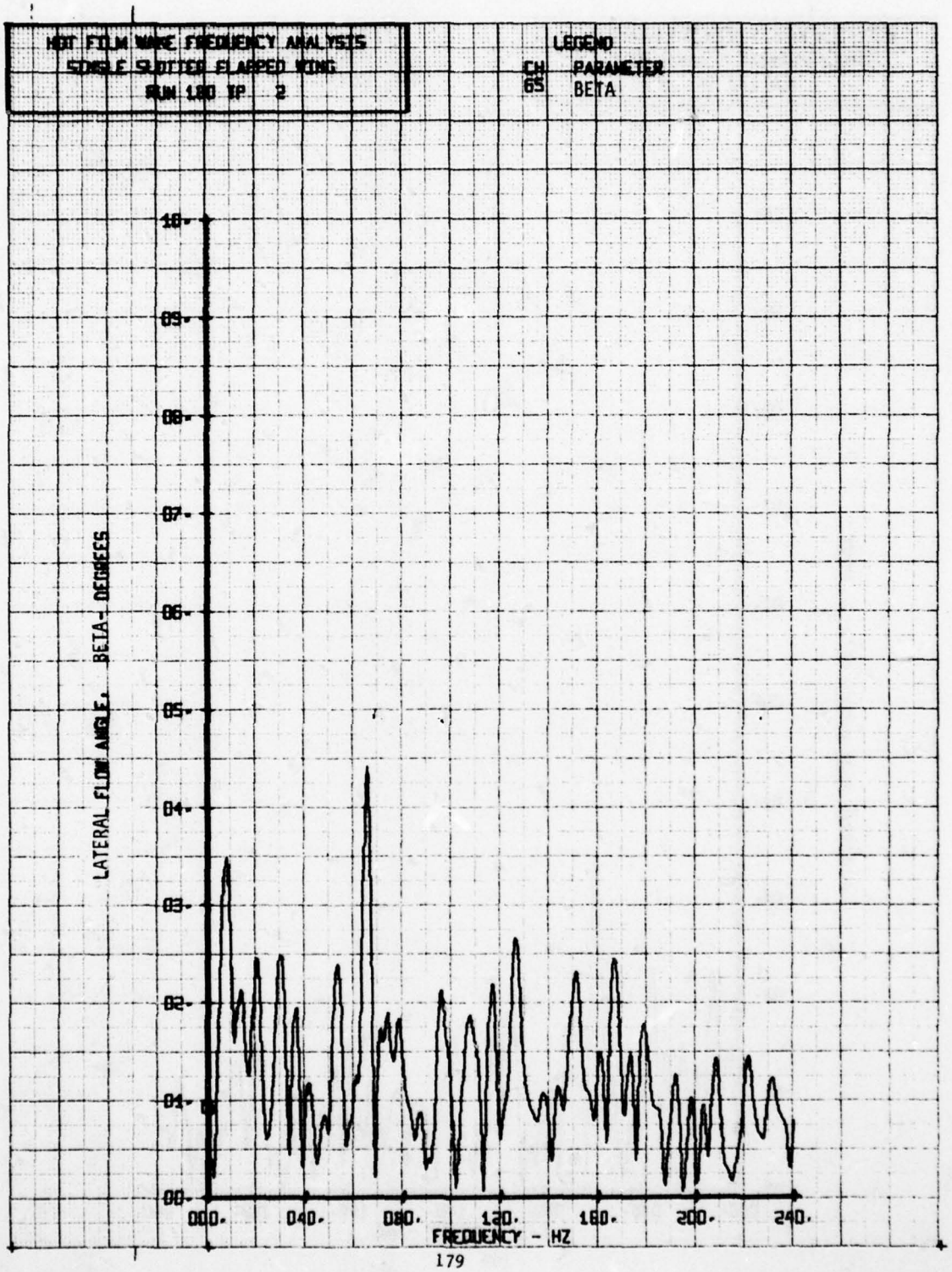
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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LATERAL FLOW ANGLE, BETA- DEGREES
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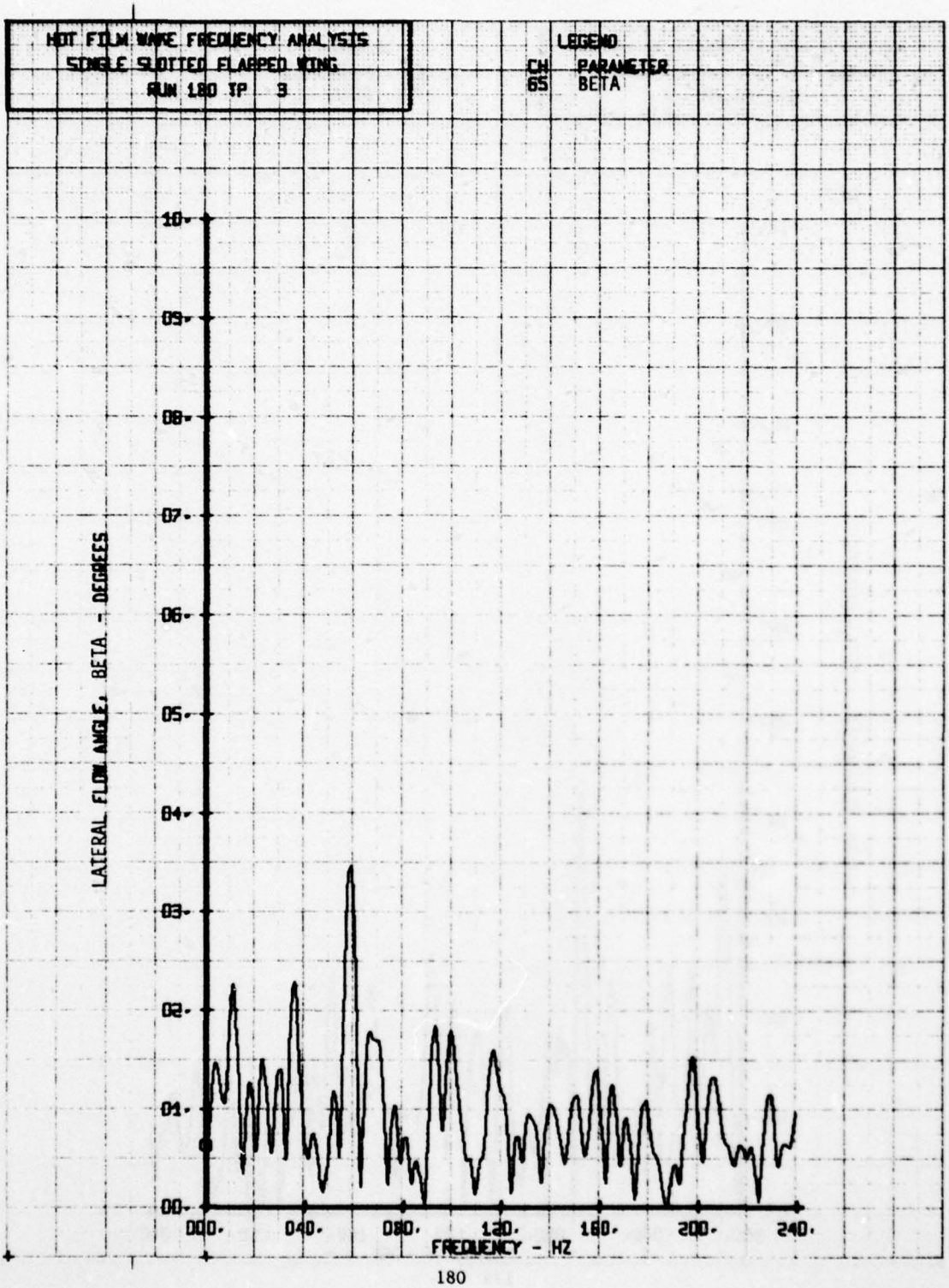
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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LATERAL FLOW ANGLE, BETA - DEGREES
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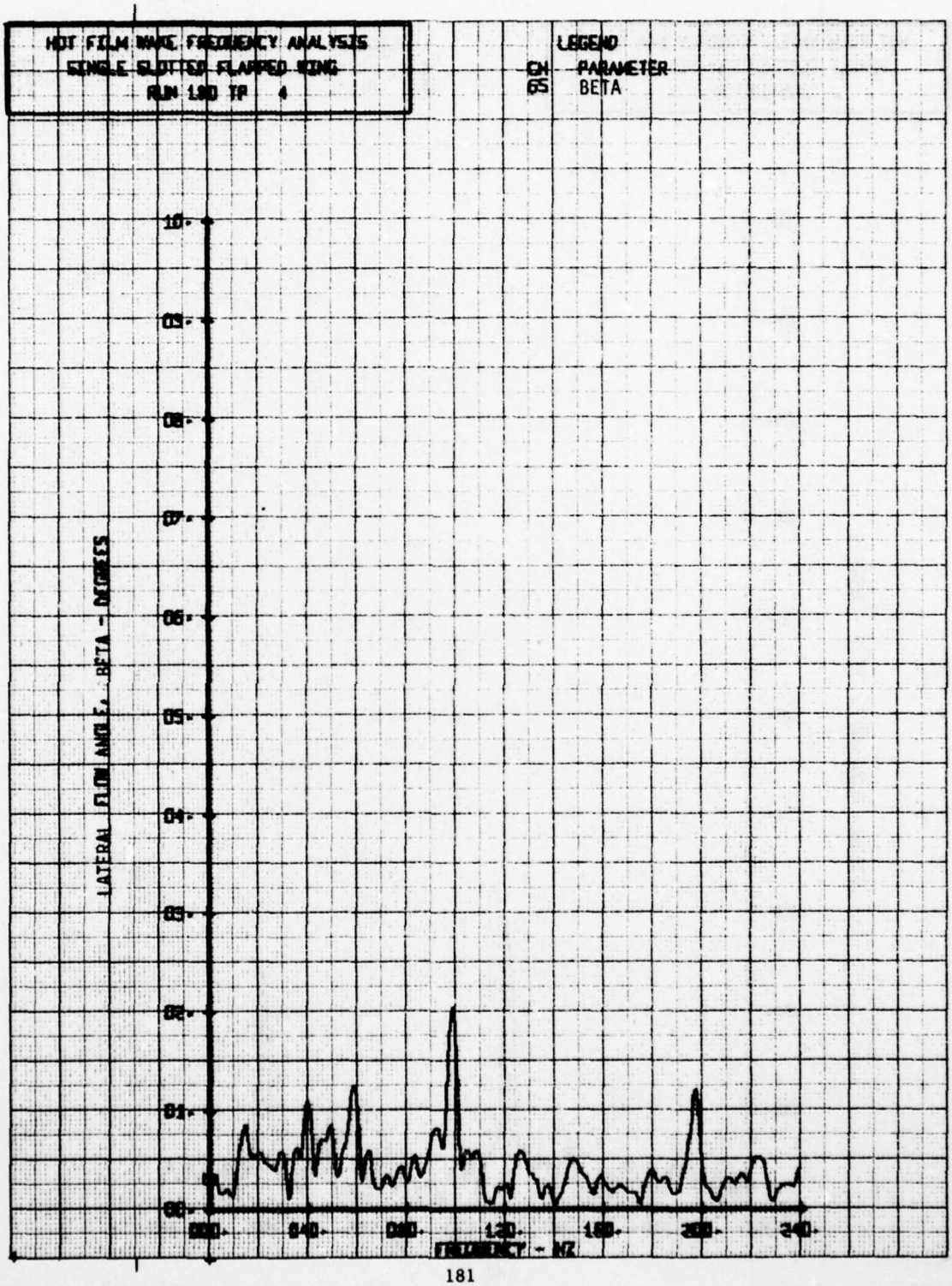
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 4
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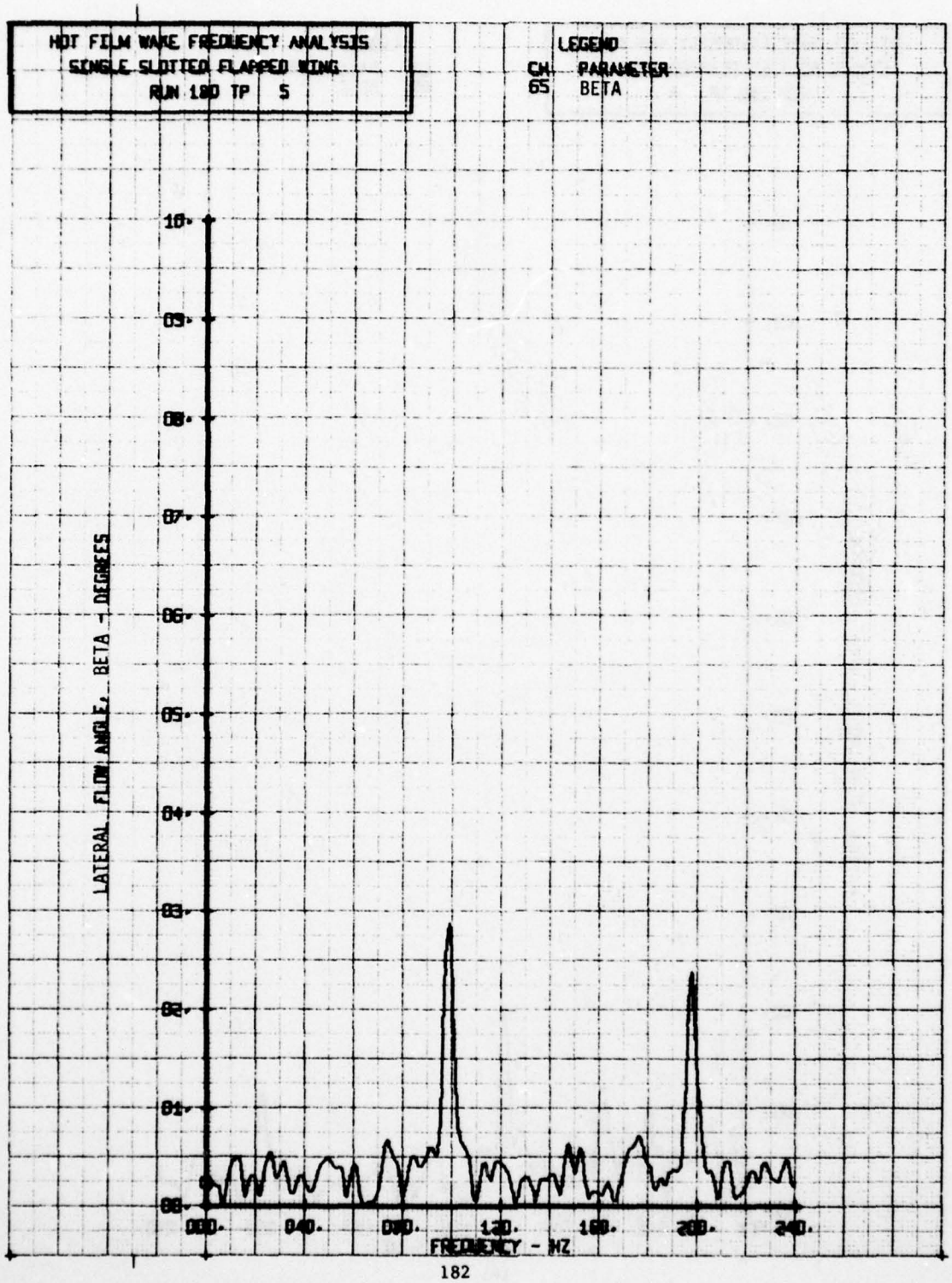
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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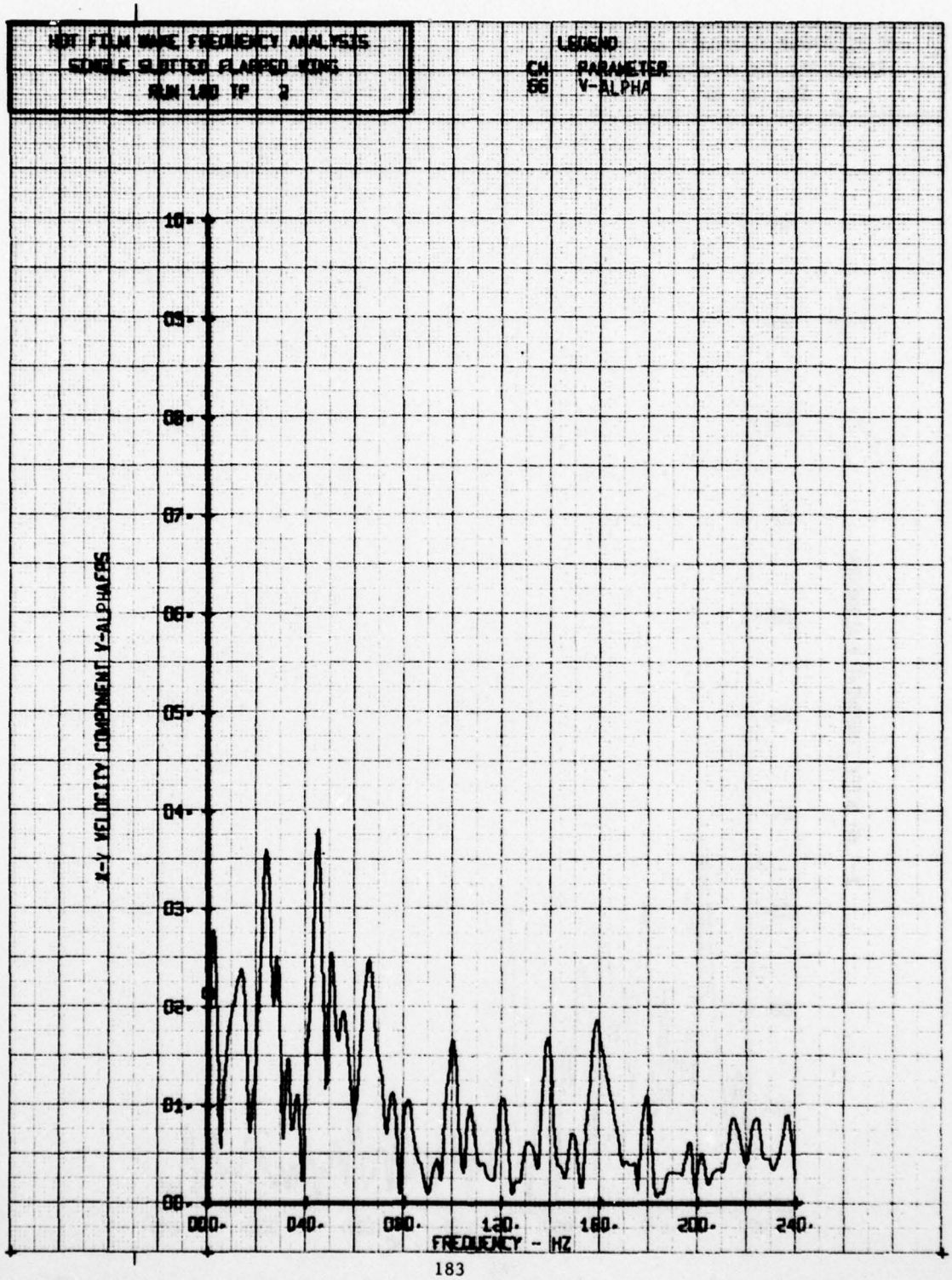
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 3
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SPECTRAL DENSITY OF NORMALIZED VELOCITY V-ALPHA
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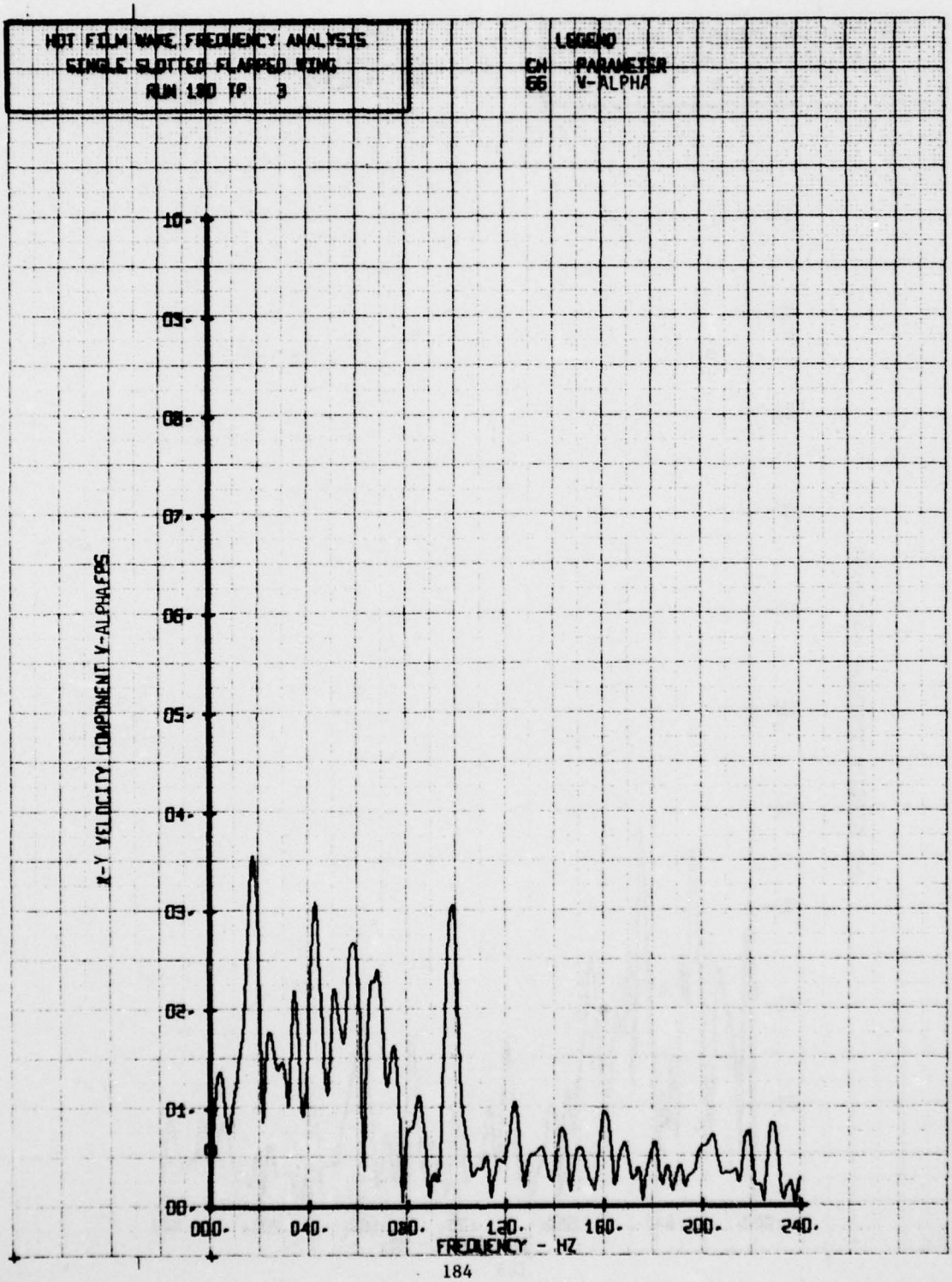
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
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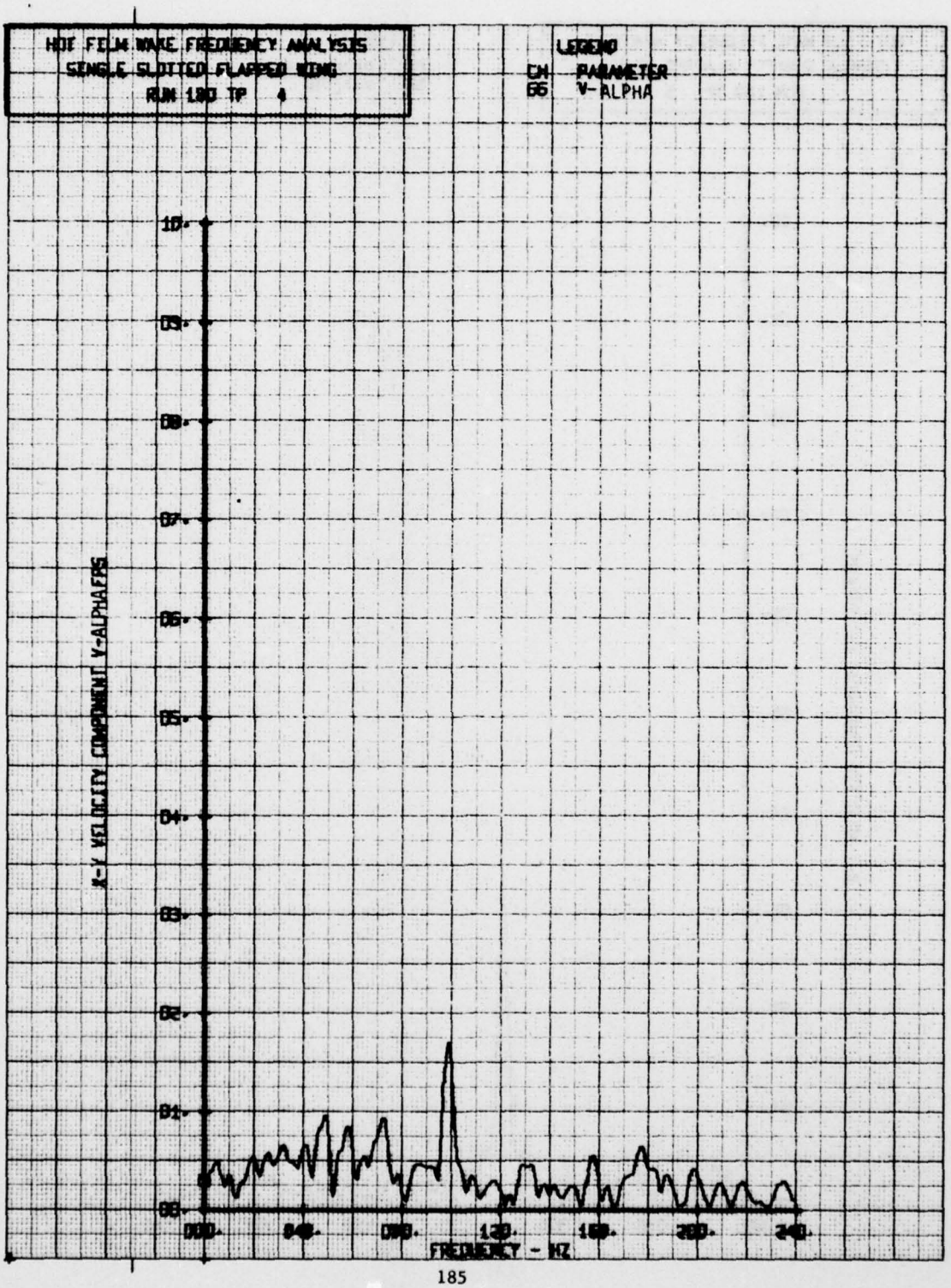
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 4
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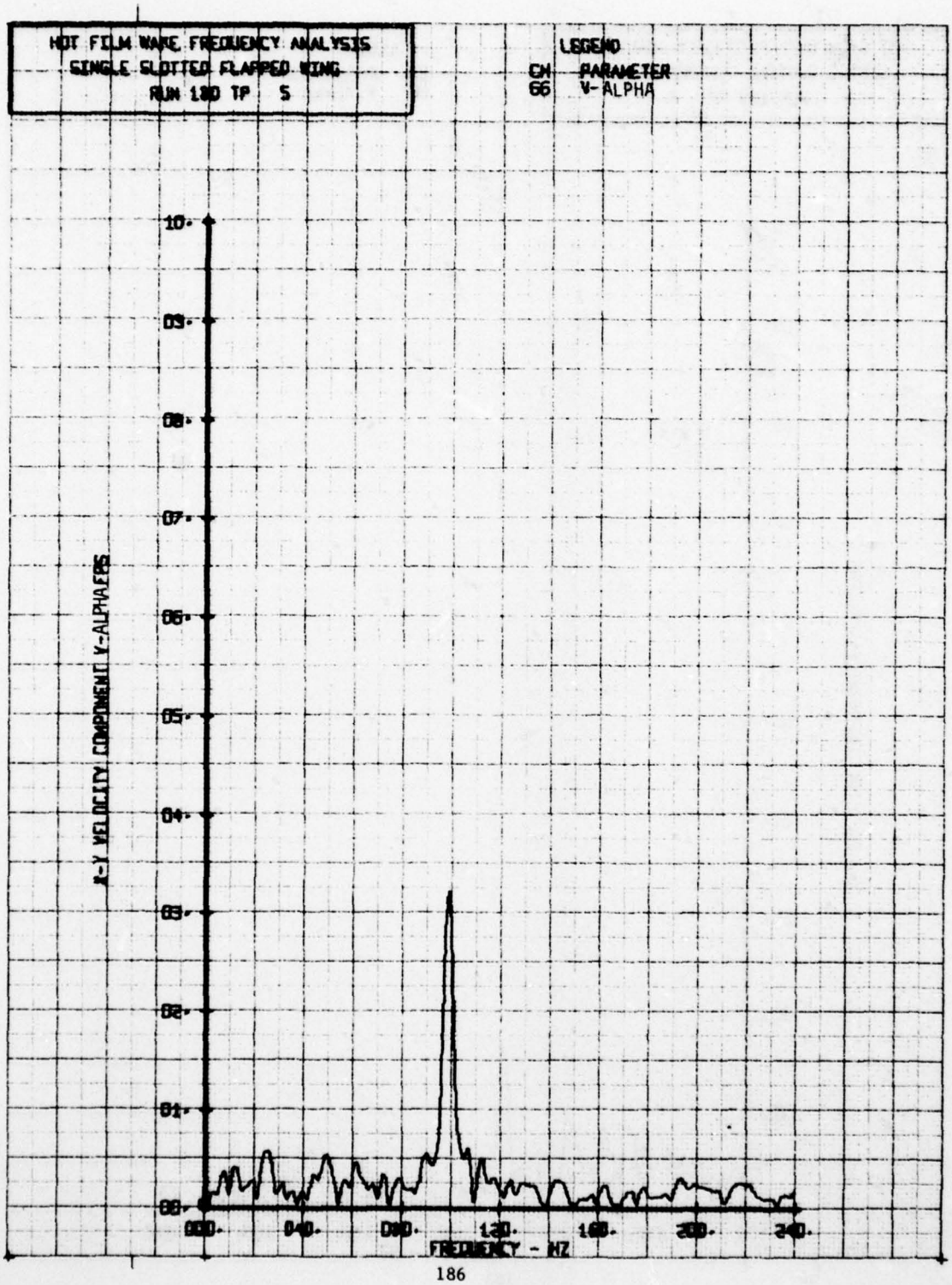
HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 5
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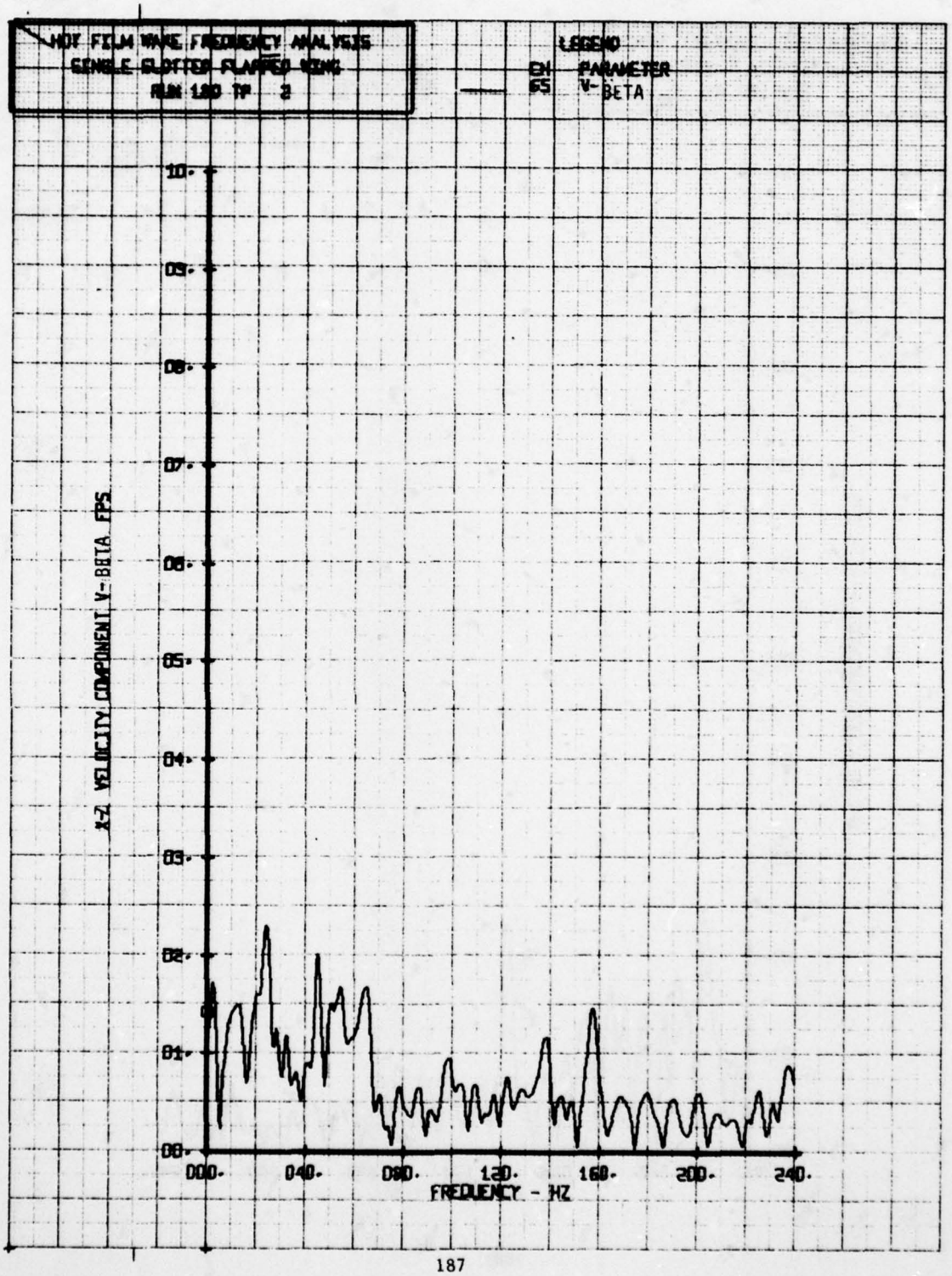
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 2
LEGEND
CH PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FPS
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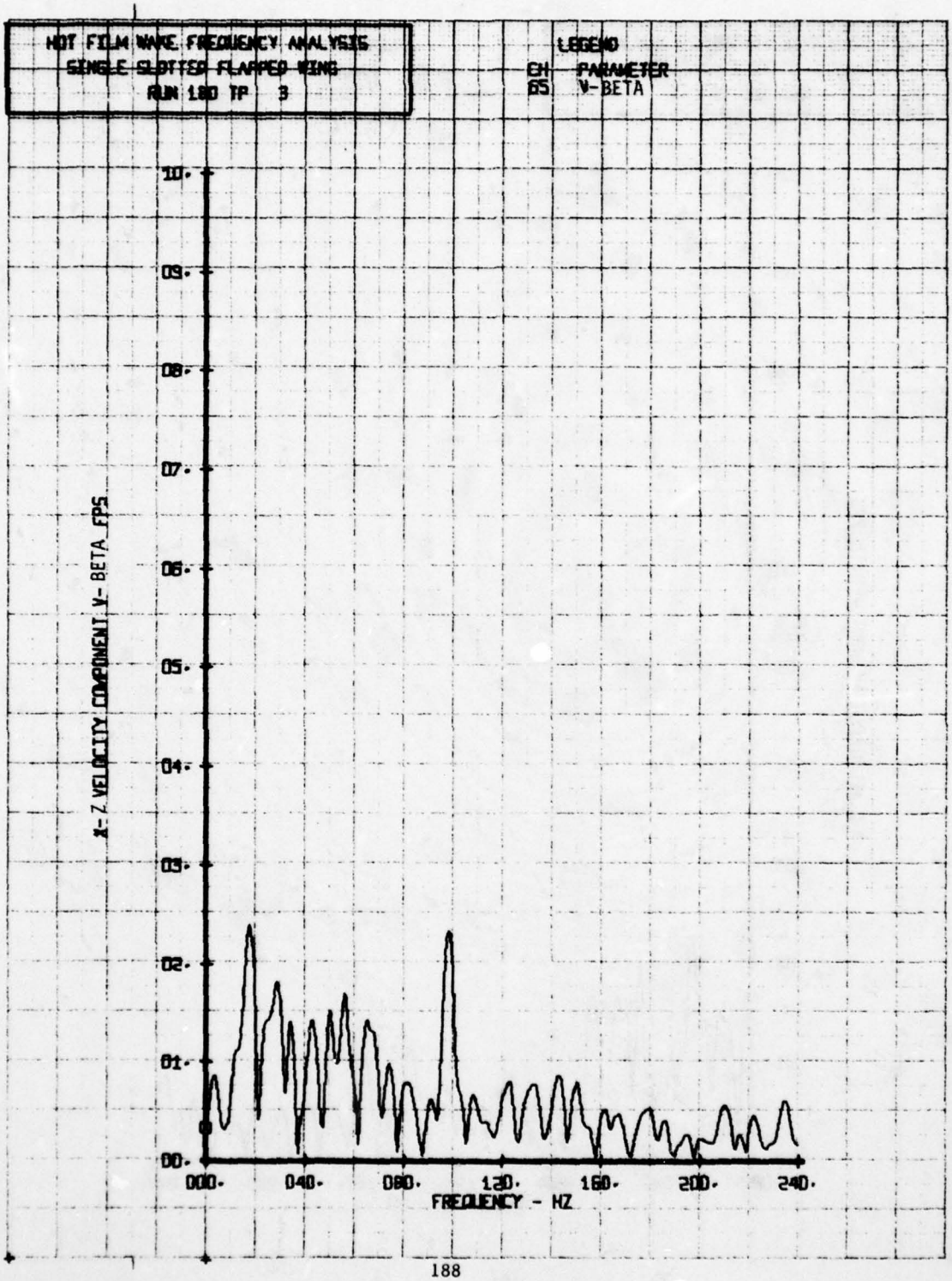
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 3
LEGEND
CH PARAMETER
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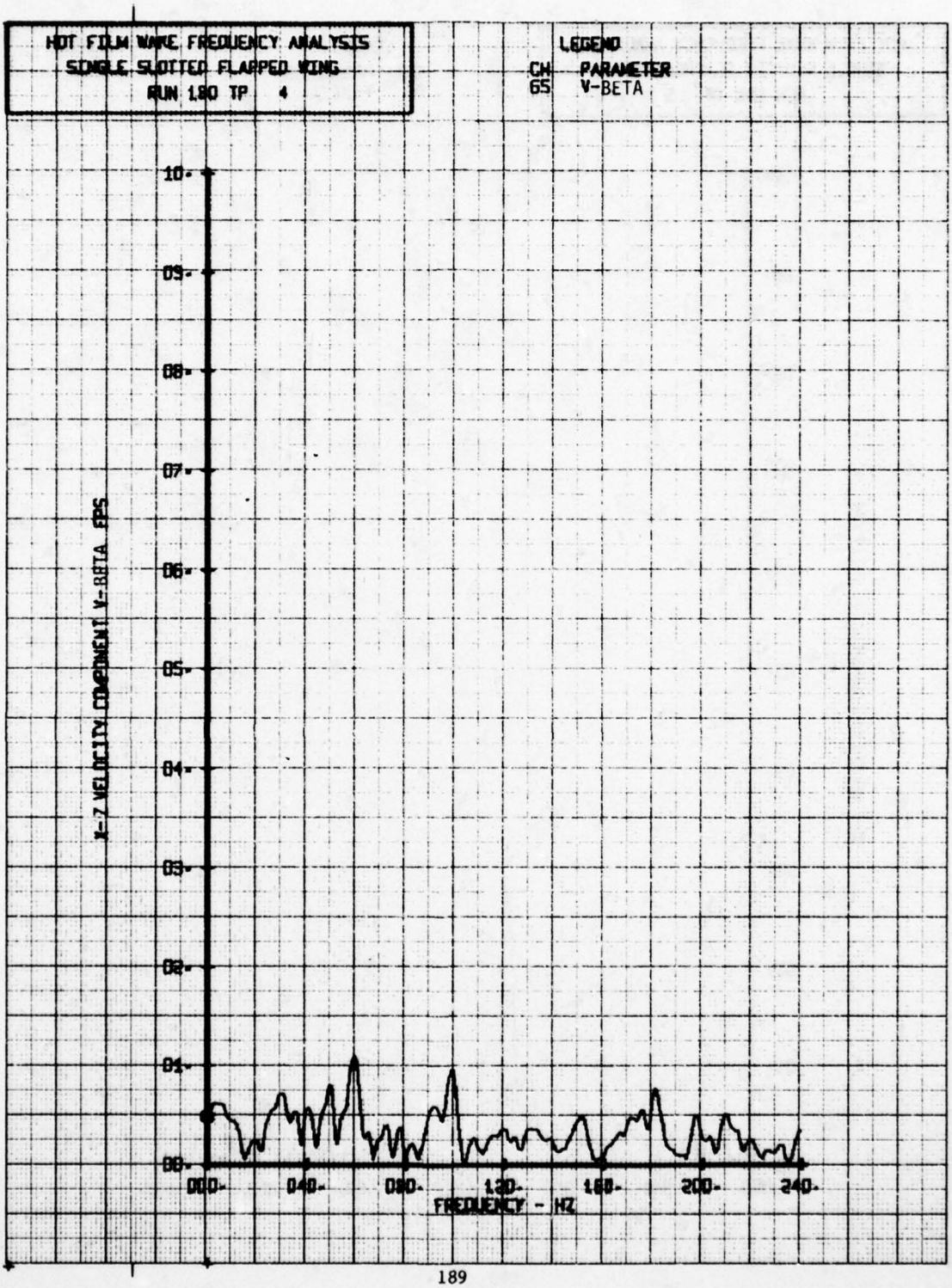
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
SINGLE SLOTTED FLAPPED WING
RUN 180 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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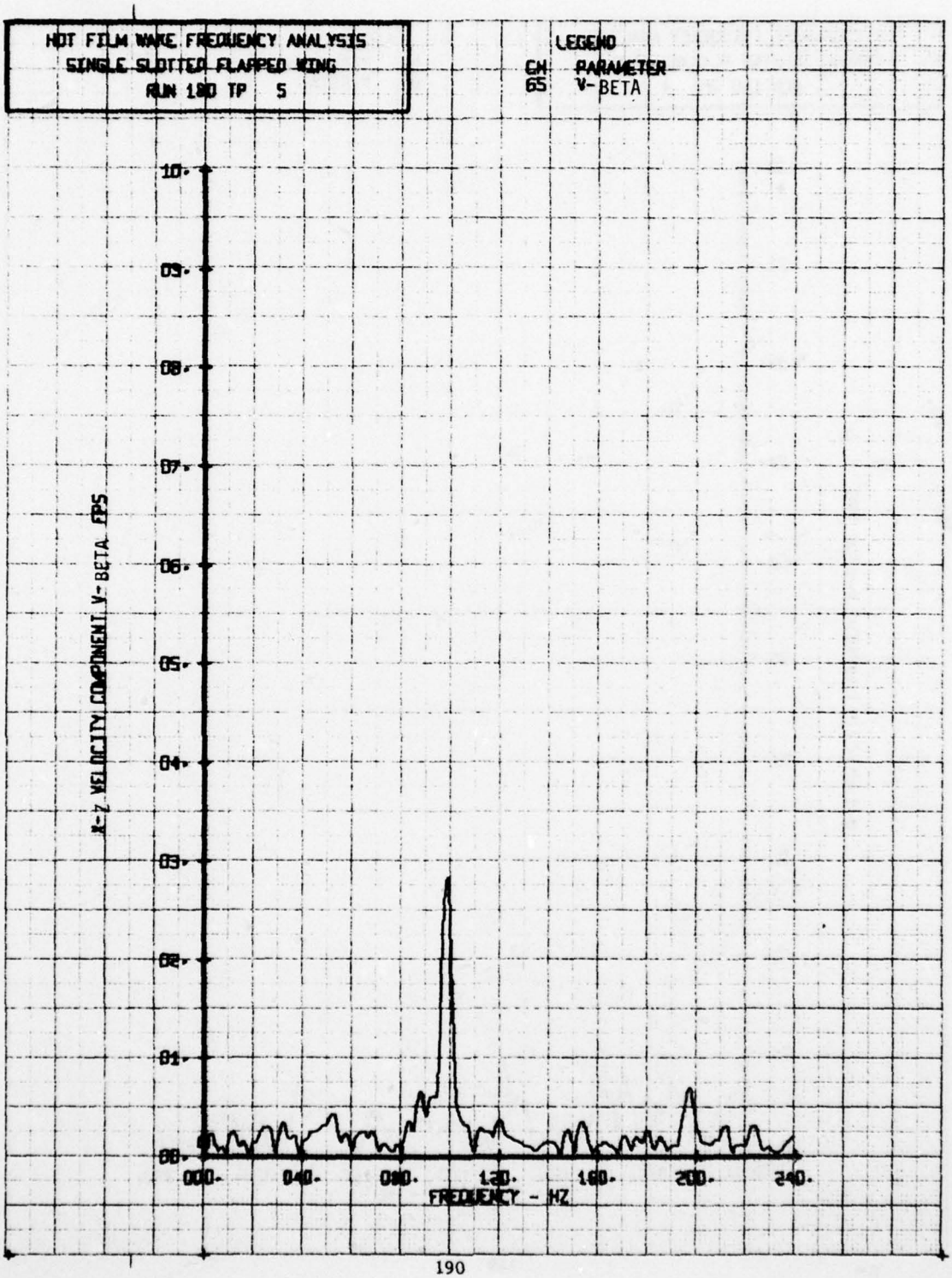
FREQUENCY - HZ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SINGLE SLOTTED FLAPPED WING
RUN 180 TP 5
LEGEND
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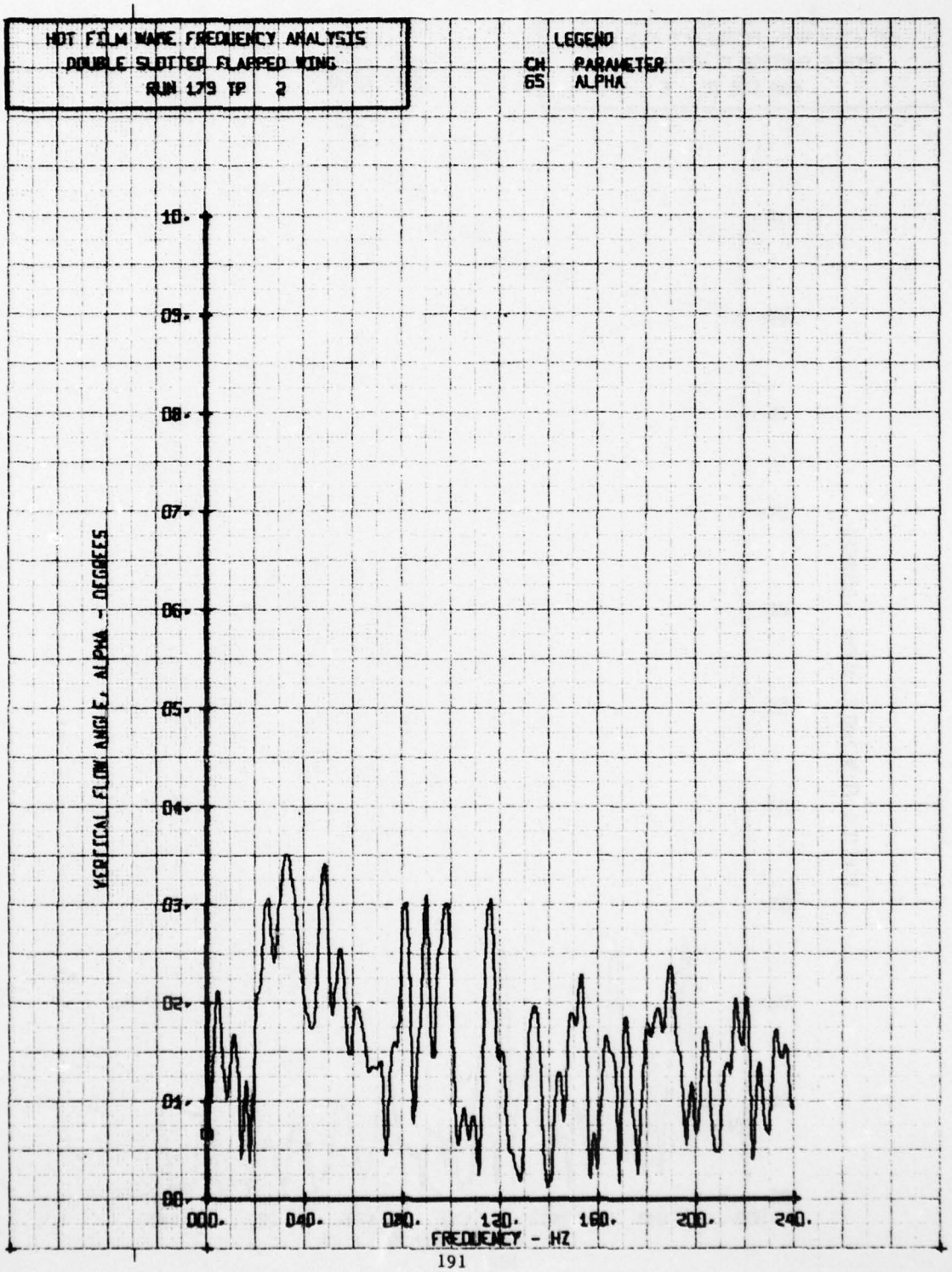
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 2
LEGEND
CH PARAMETER
65 ALPHA
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VERTICAL FLOW ANGLE, ALPHA - DEGREES
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FREQUENCY - HZ

AD-A062 117 BOEING VERTOL CO PHILADELPHIA PA F/G 1/3
INTERACTIONAL AERODYNAMICS OF THE SINGLE ROTOR HELICOPTER CONFI--ETC(U)
SEP 78 P F SHERIDAN DAAJ02-77-C-0020
UNCLASSIFIED USARTL-TR-78-23G NL

3 OF 3
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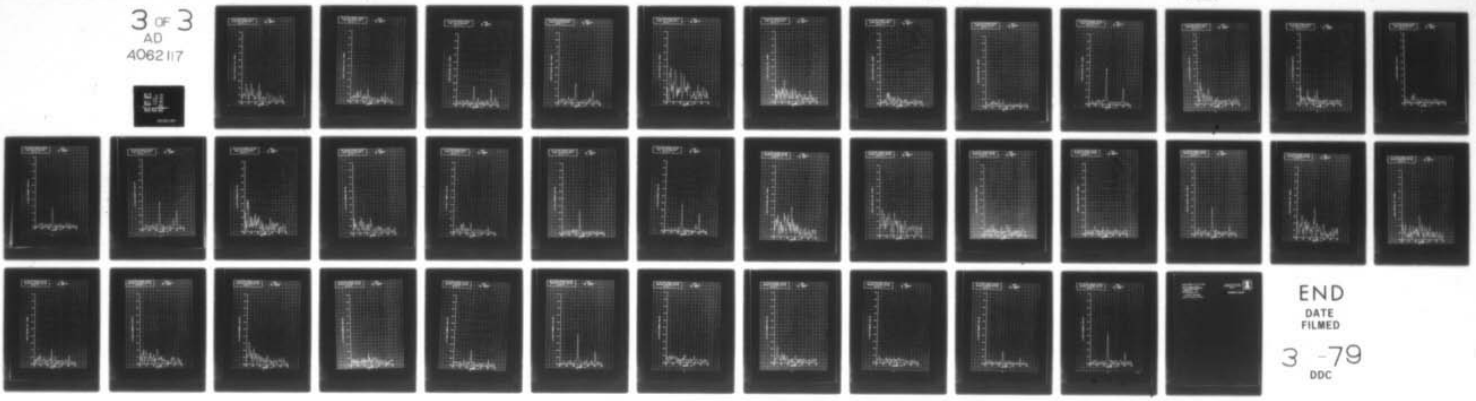

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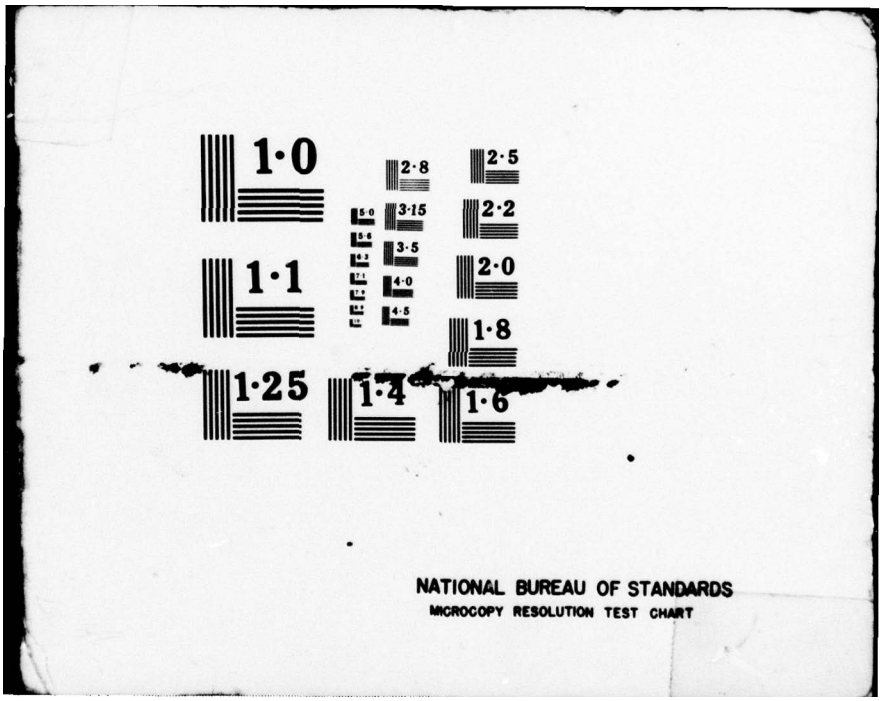
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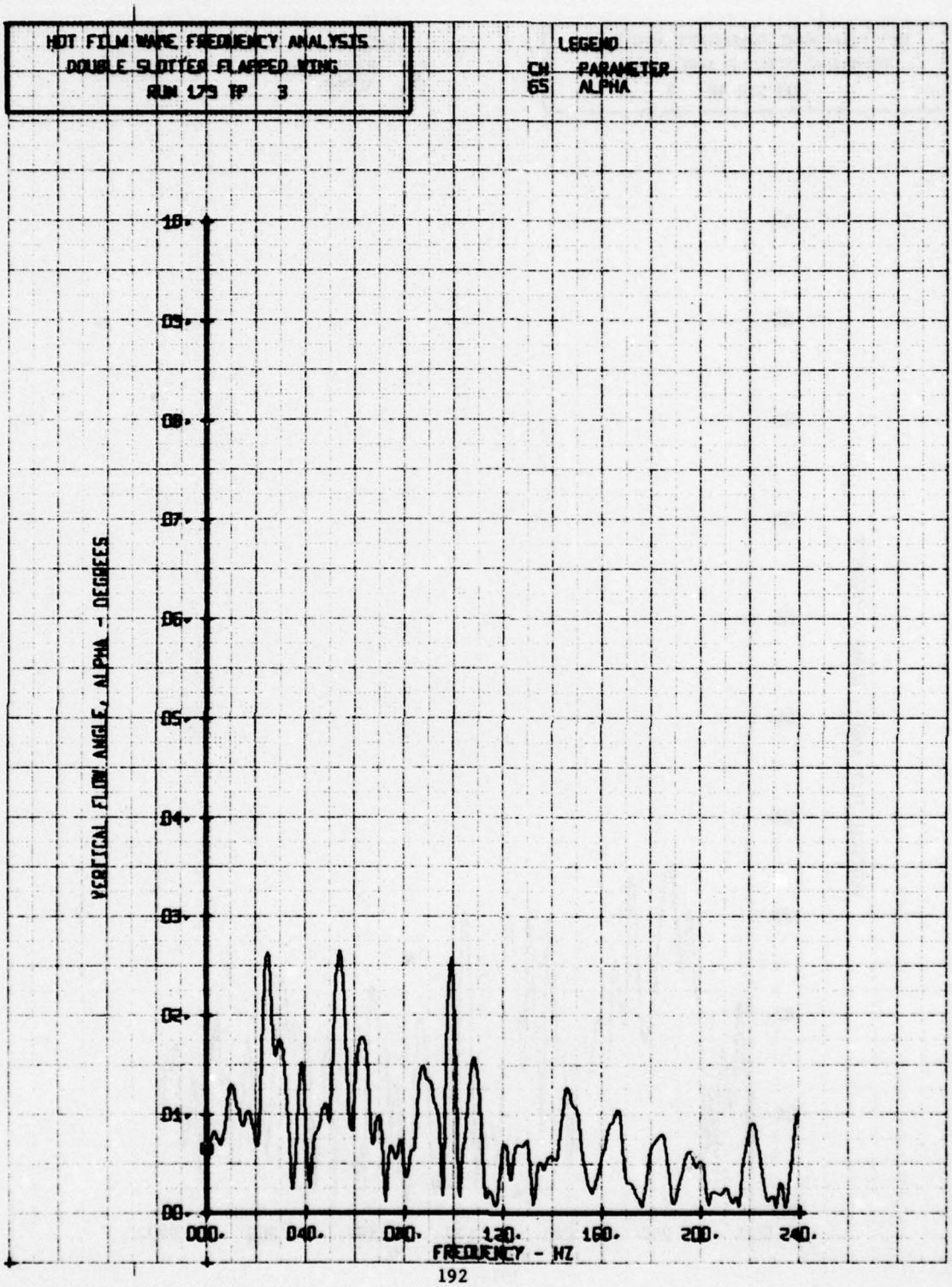
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART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DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 3
LEGEND
CH PARAMETER
65 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
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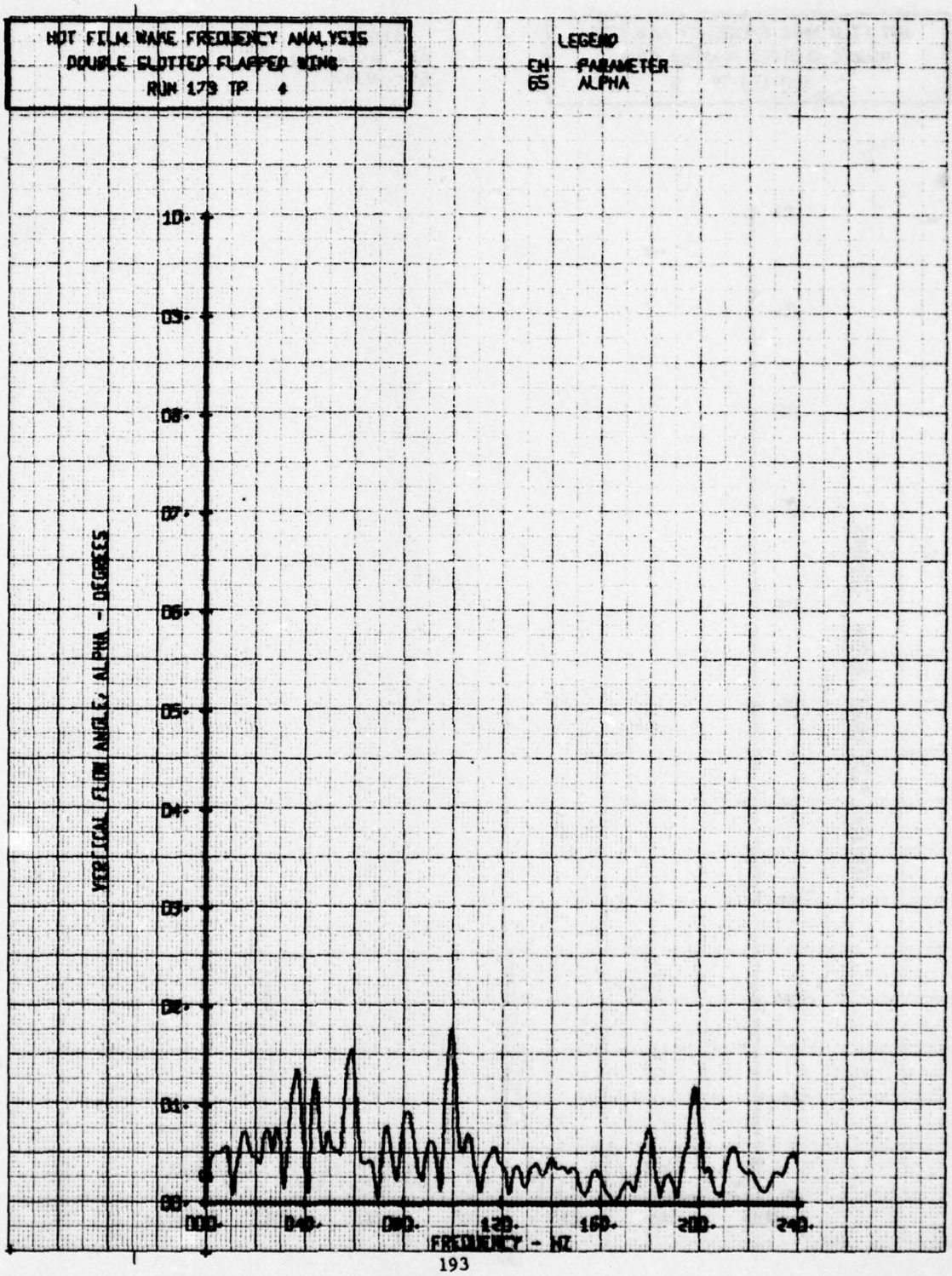
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 173 TP 4
LEGEND
CH PARAMETER
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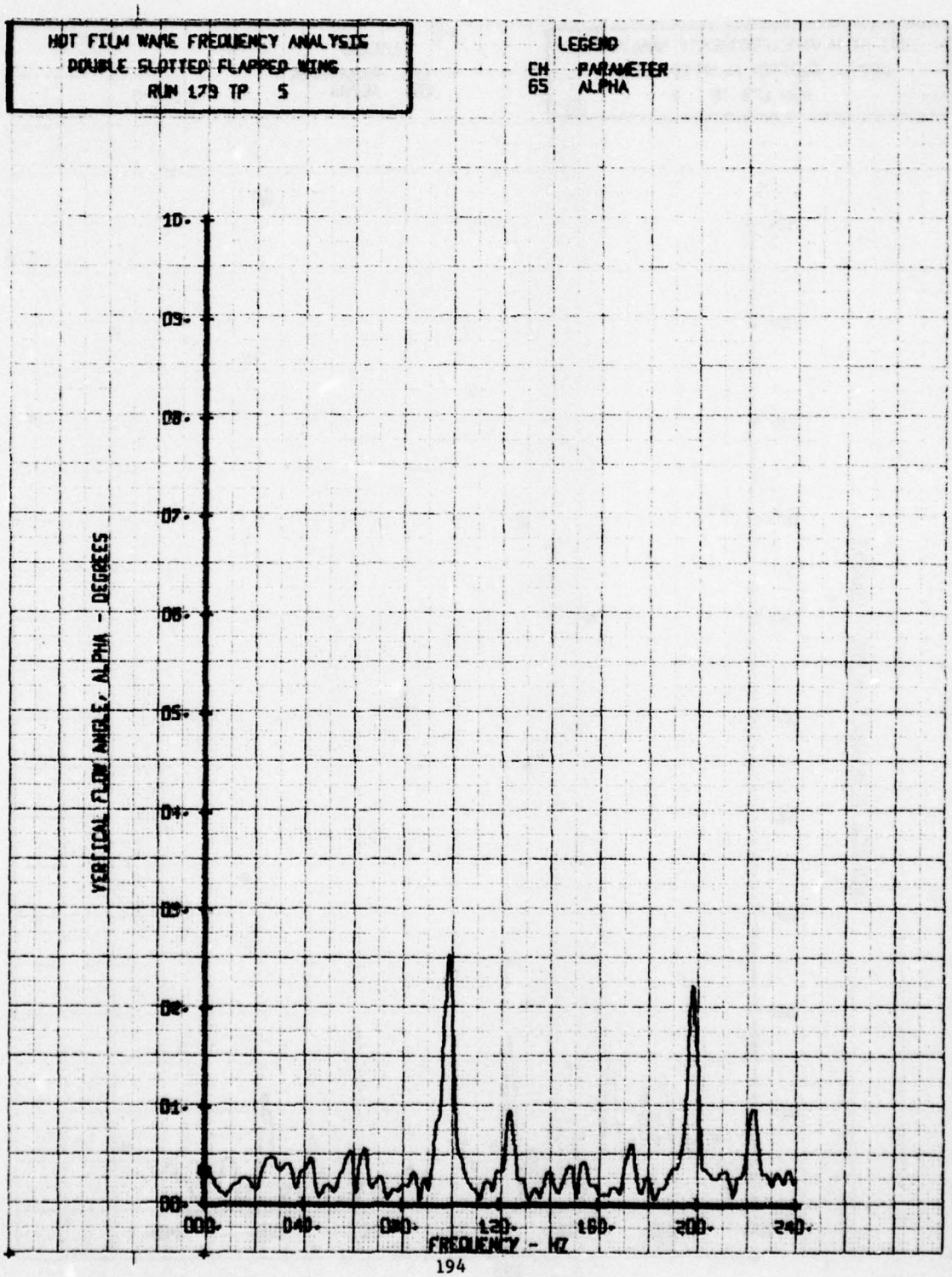
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 5
LEGEND
CH PARAMETER
65 ALPHA
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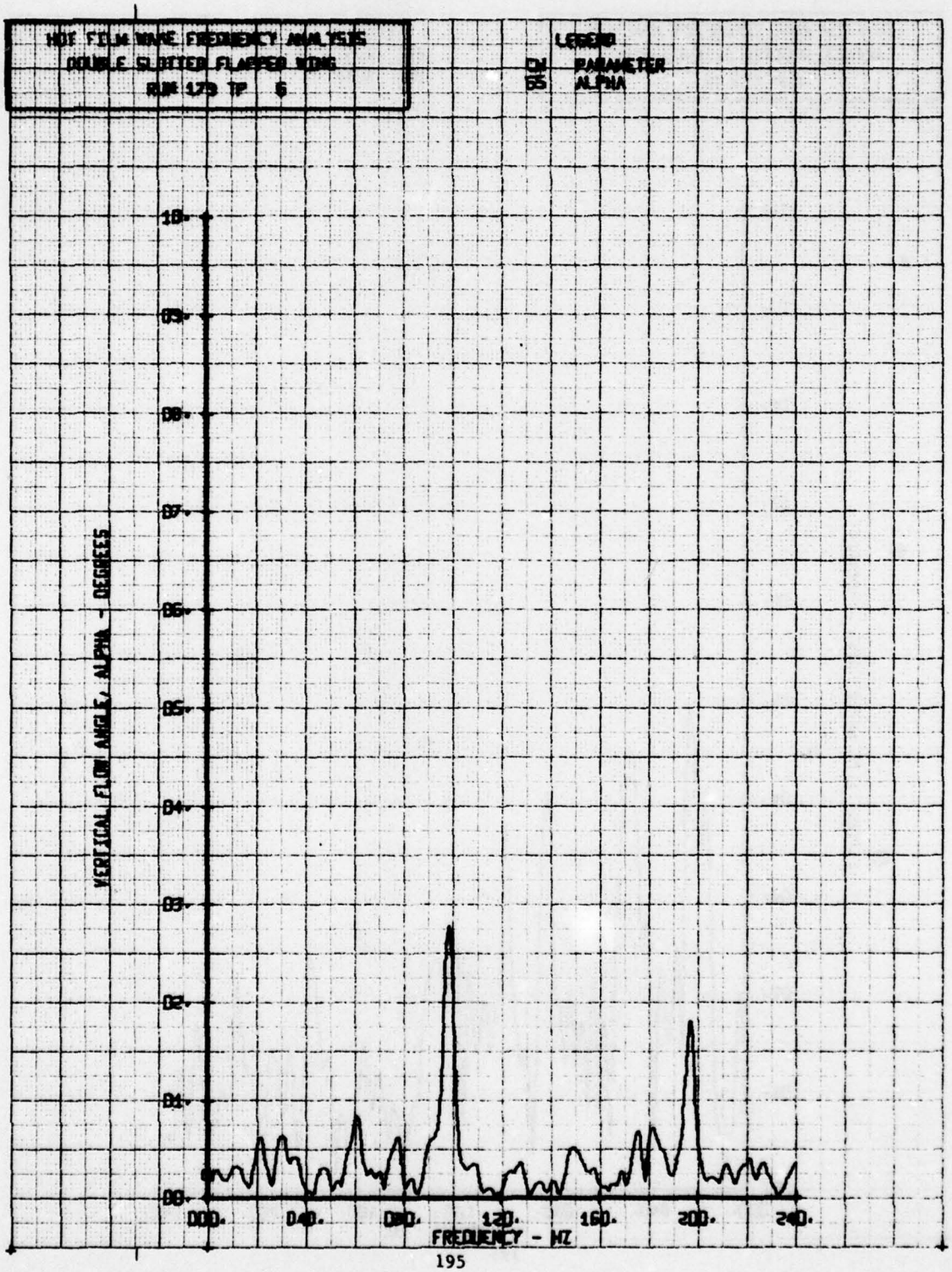
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 6
LEGEND
CN PARAMETER
85 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
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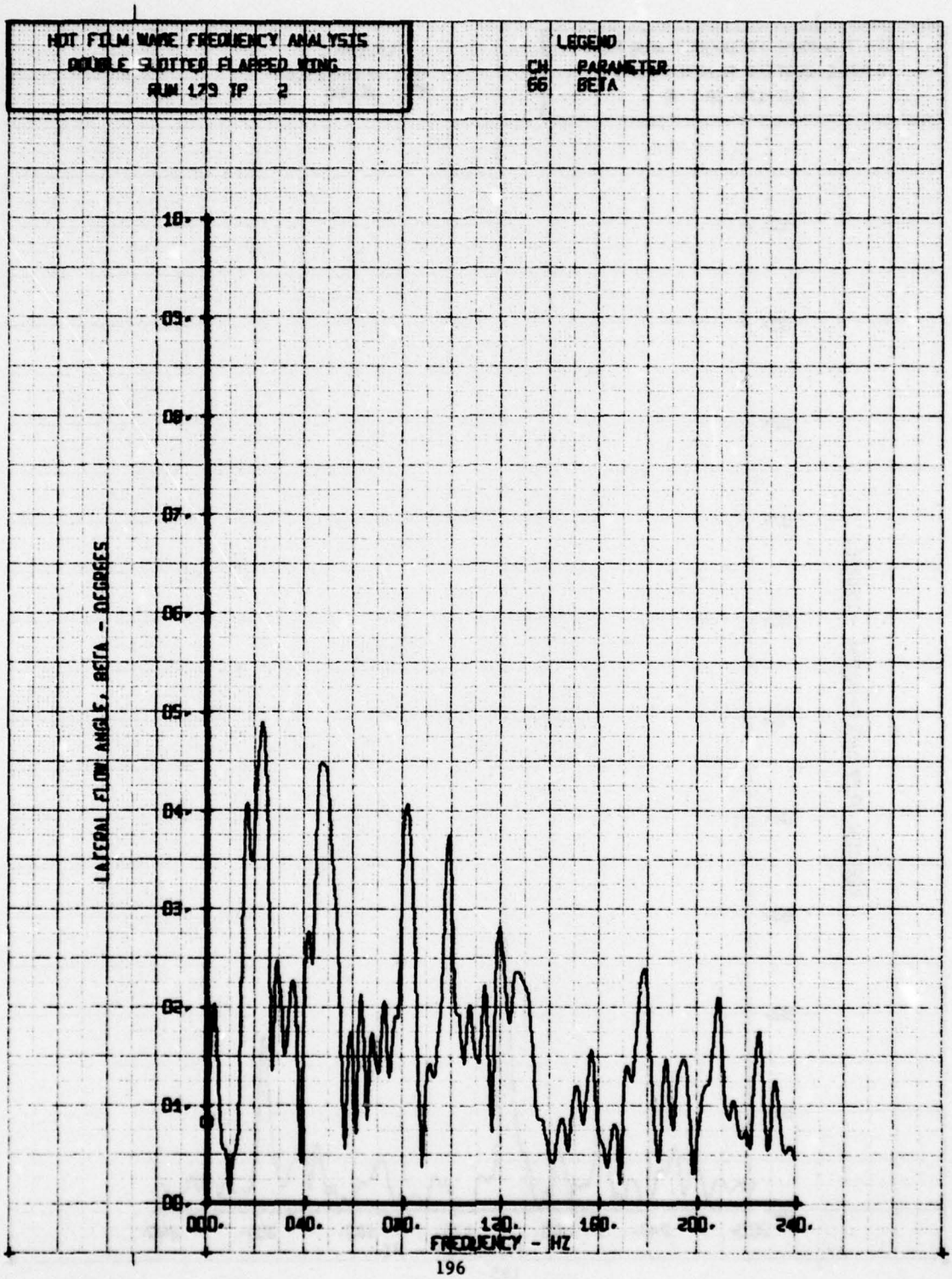
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 2
LEGEND
CH PARAMETER
66 BETA
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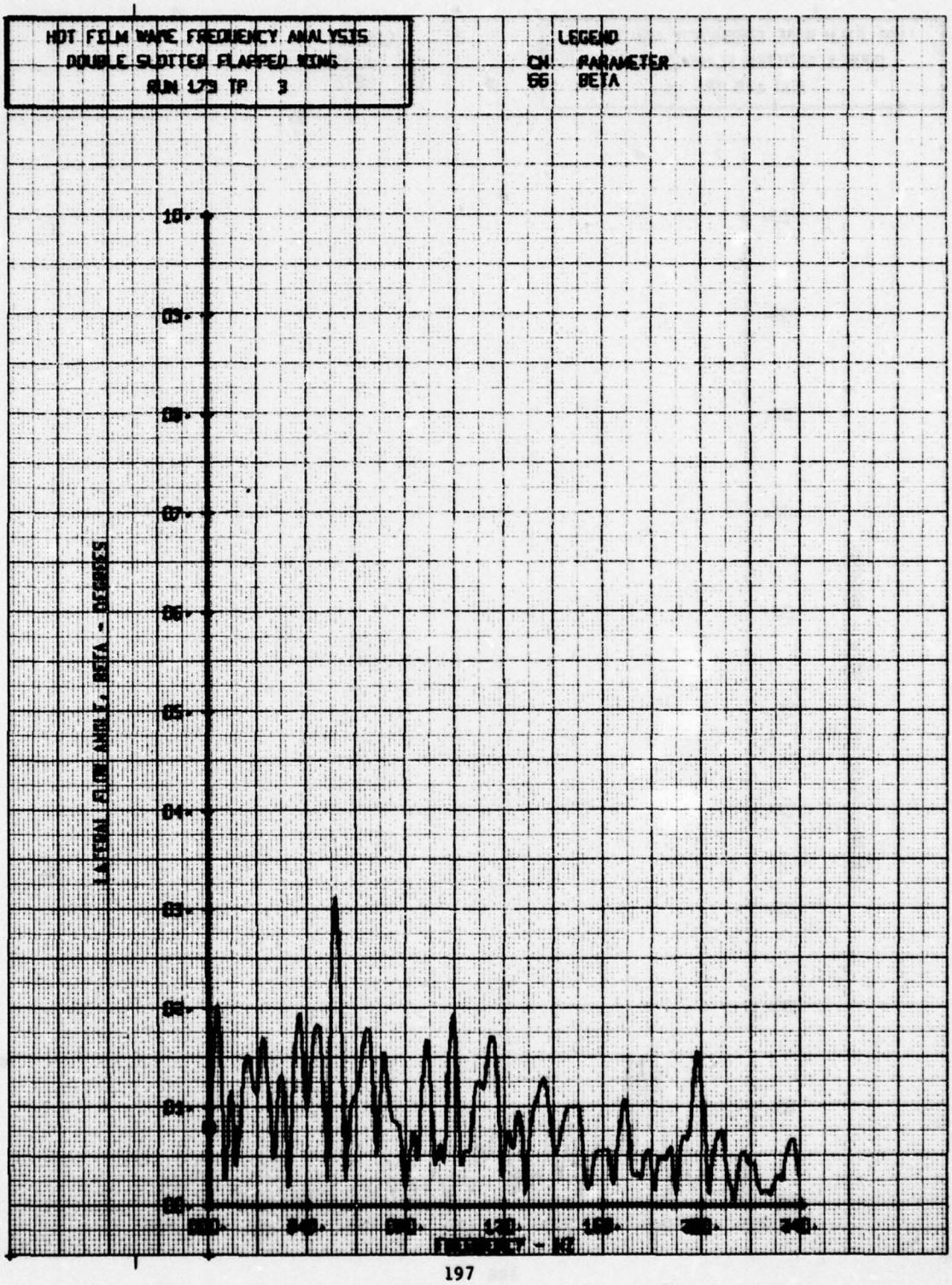
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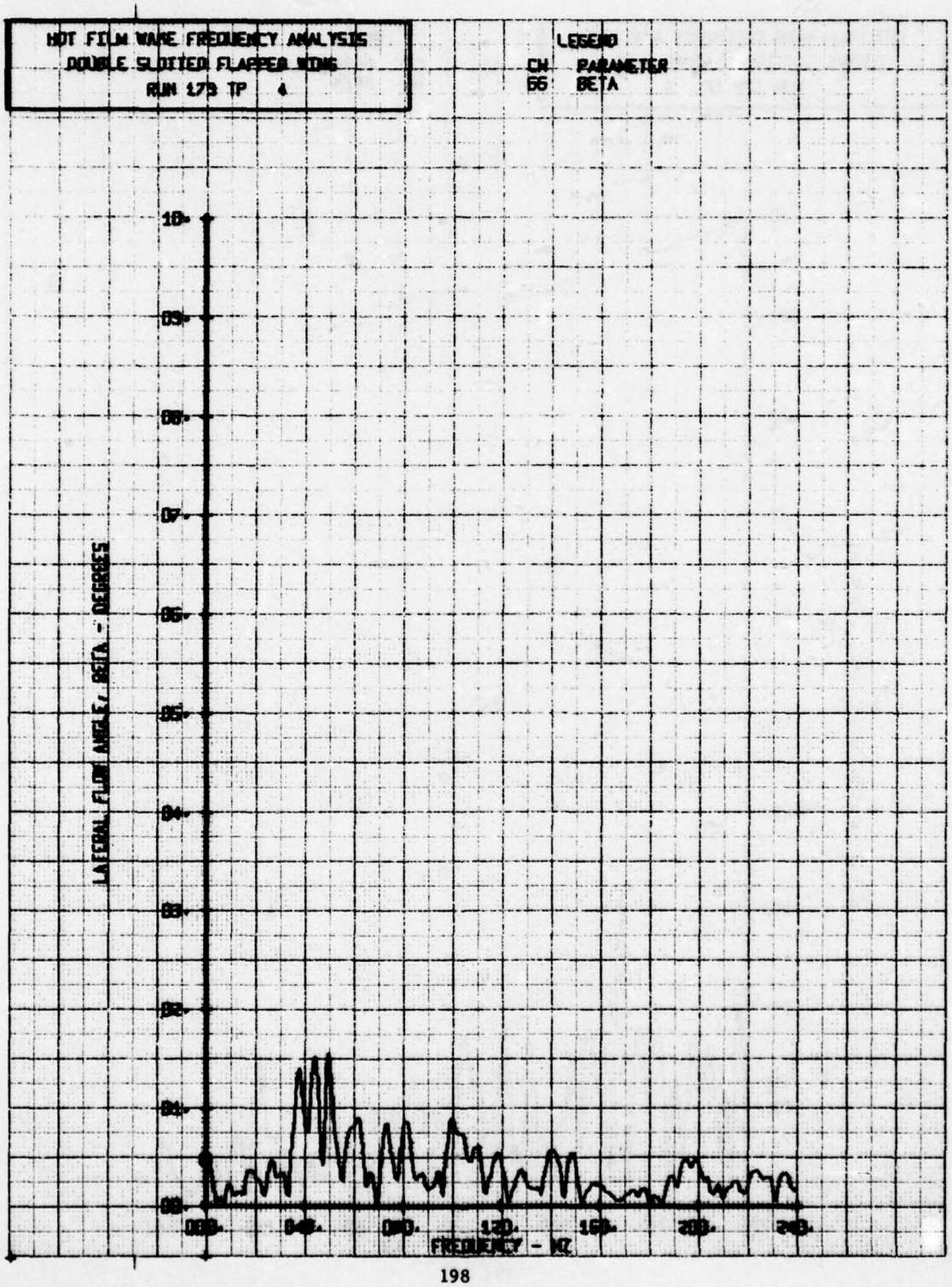
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 3
LEGEND
CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES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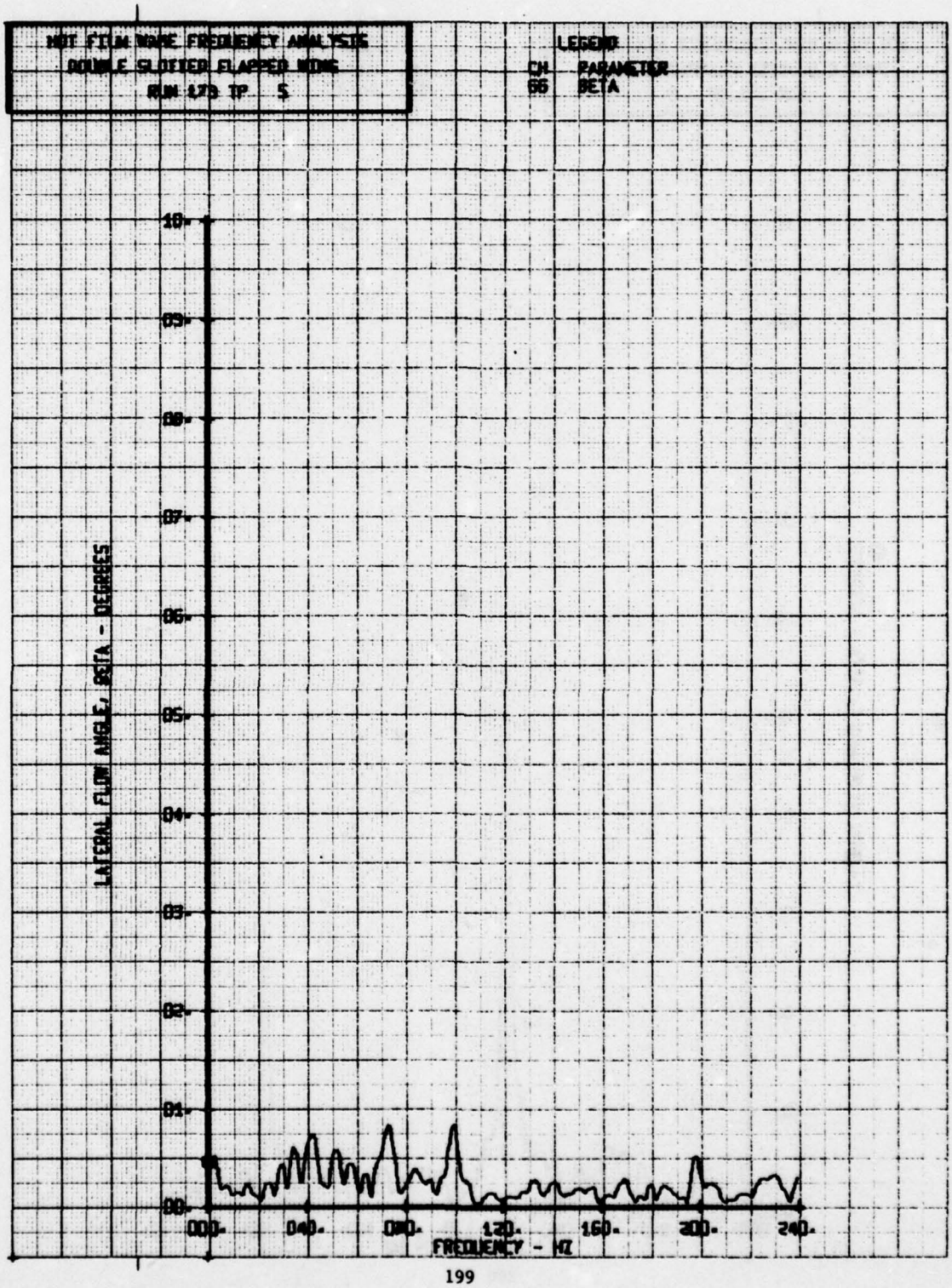
DOUBLE SLOTTED FLAPPER WING
RUN 179 TP 4
LEGEND
CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 173 TP 5
LEGEND
CH PARAMETER
66 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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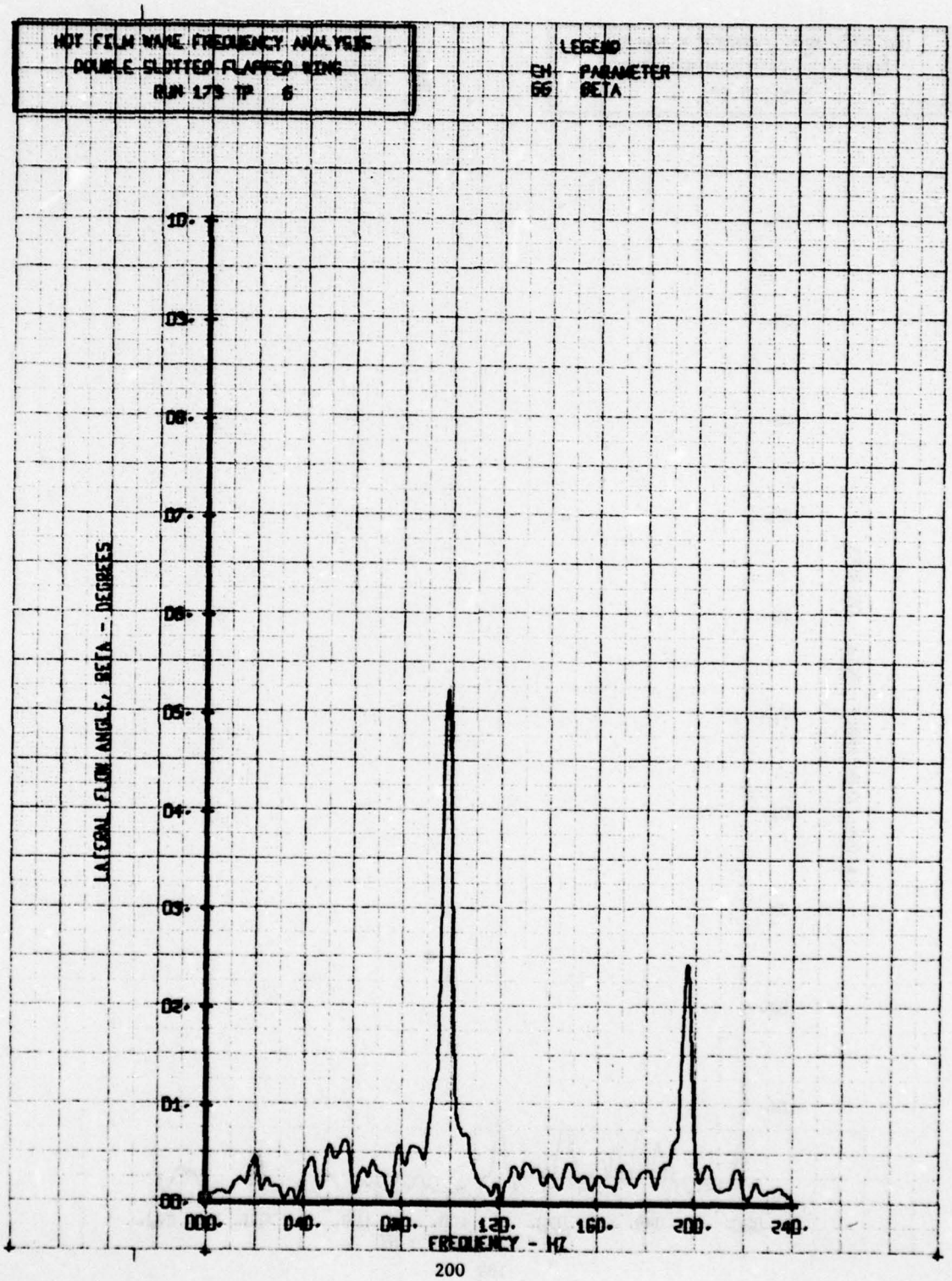
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 173 TP 6
LEGEND
EH PARAMETER
66 BETA
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LATERAL FLOW ANGLE, BETA - DEGREES
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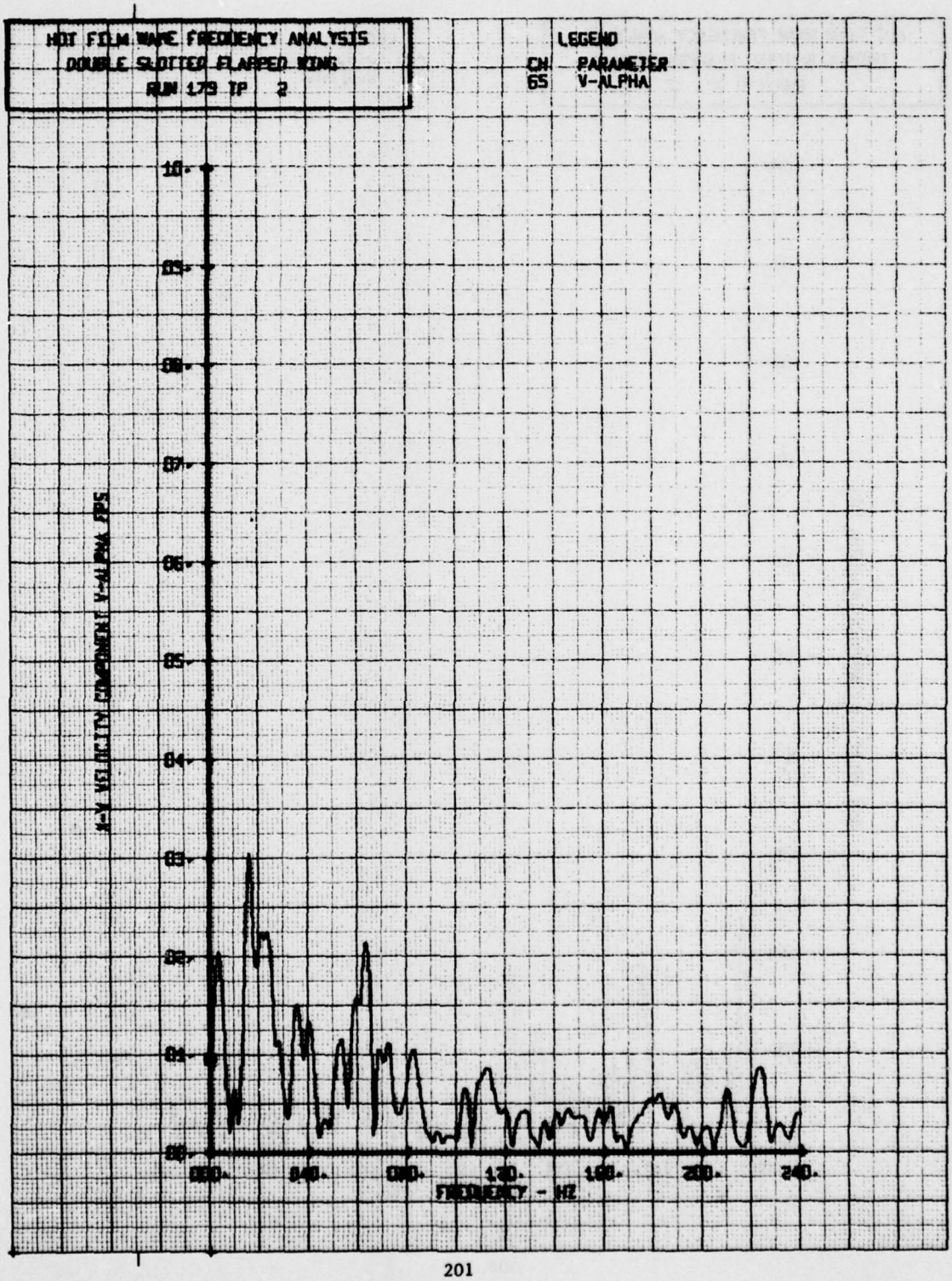
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 173 TP 2
LEGEND
CH PARAMETER
65 V-ALPHA
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V-V VELOCITY COMPONENT V-ALPHA RMS
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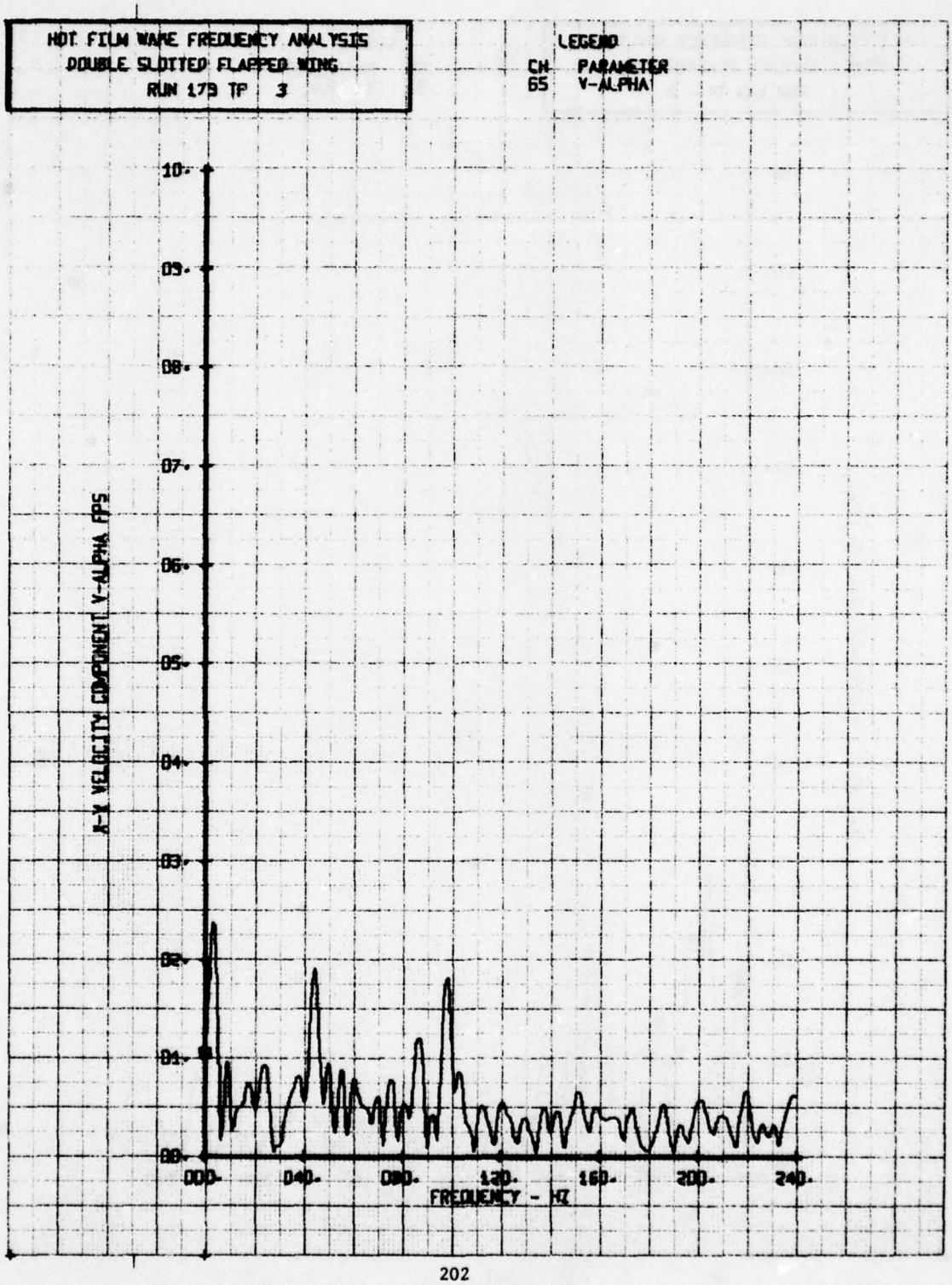
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 3
LEGEND
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U-V VELOCITY COMPONENT V-ALPHA FPS
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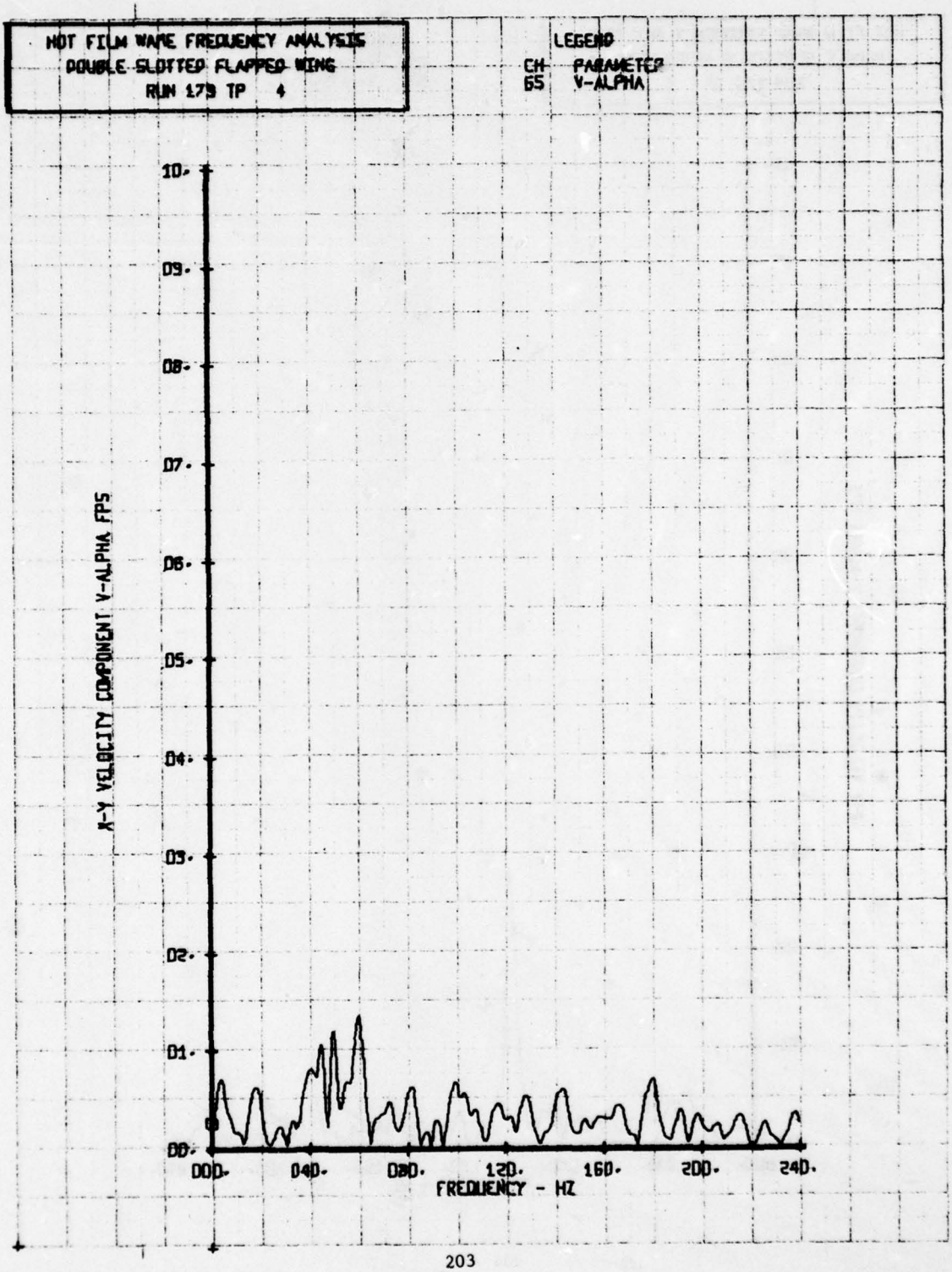
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 4
LEGEND
CH PARAMETER
65 V-ALPHA
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A-V VELOCITY COMPONENT V-ALPHA FPS
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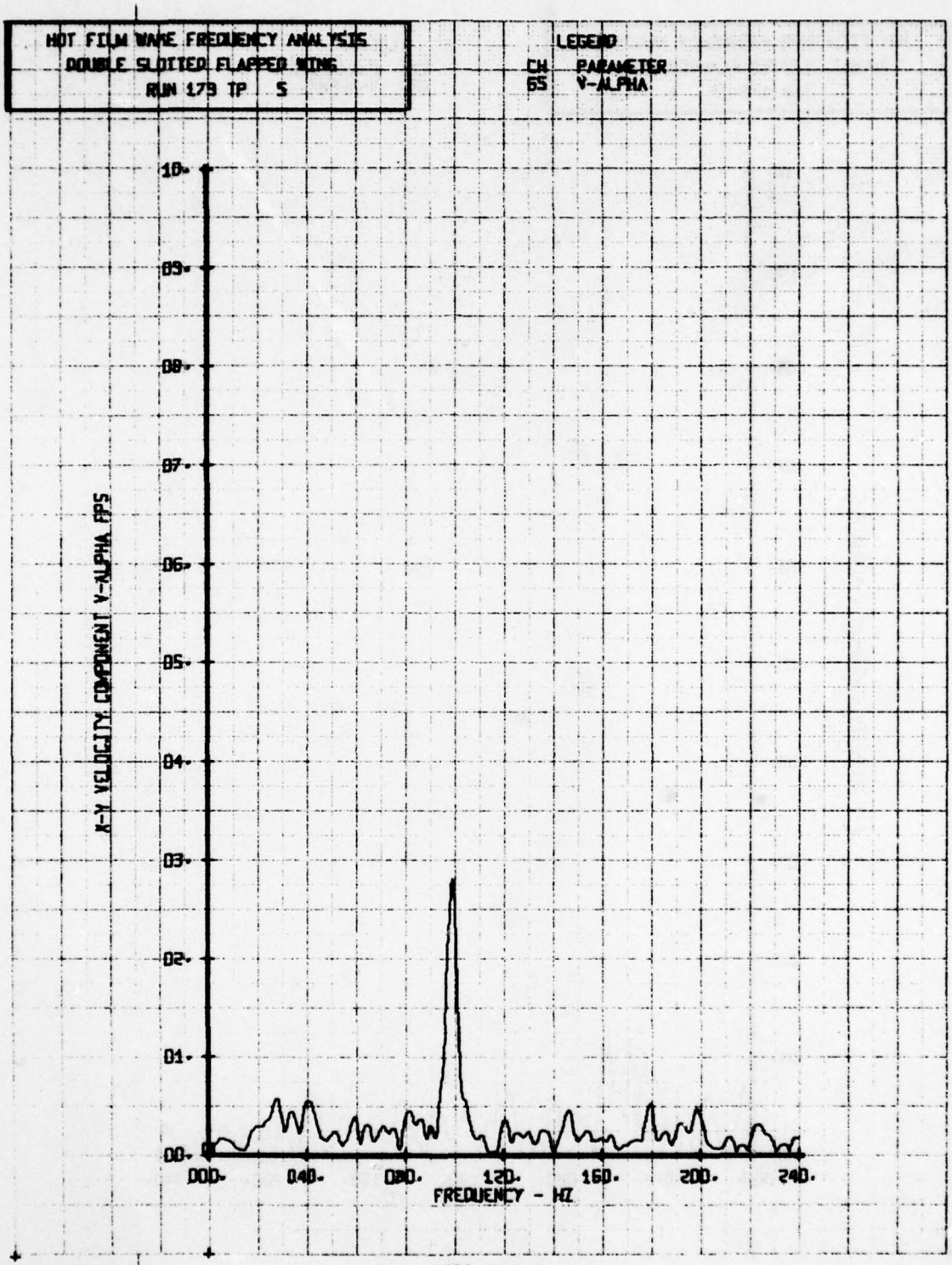
FREQUENCY - HZ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DOUBLE SLOTTED FLAPPED WING
RUN 173 TP 5
LEGEND
CH PARAMETER
65 V-ALPHA
X-V VELOCITY COMPONENT V-ALPHA FPS
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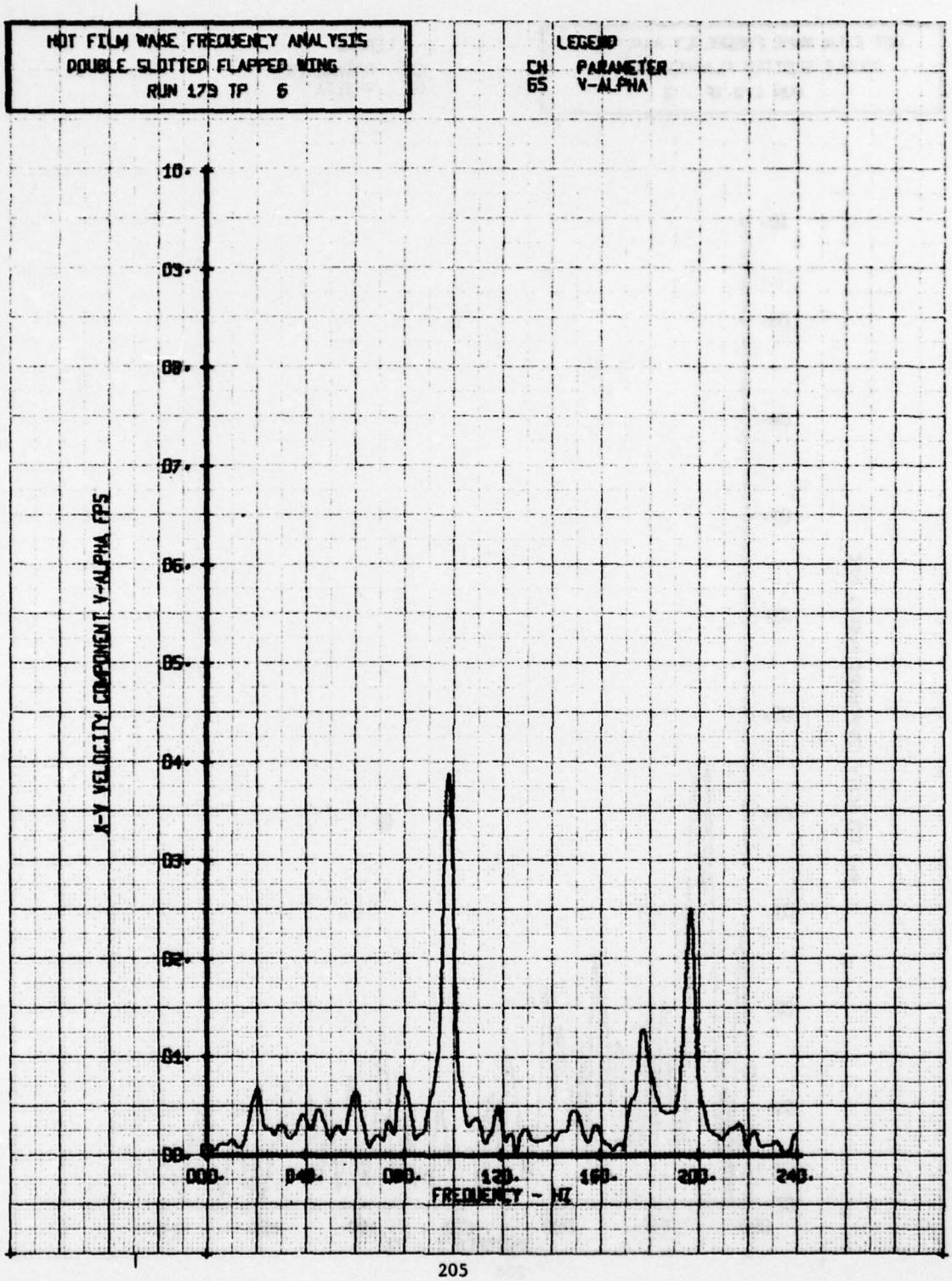
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 6
LEGEND
CH PARAMETER
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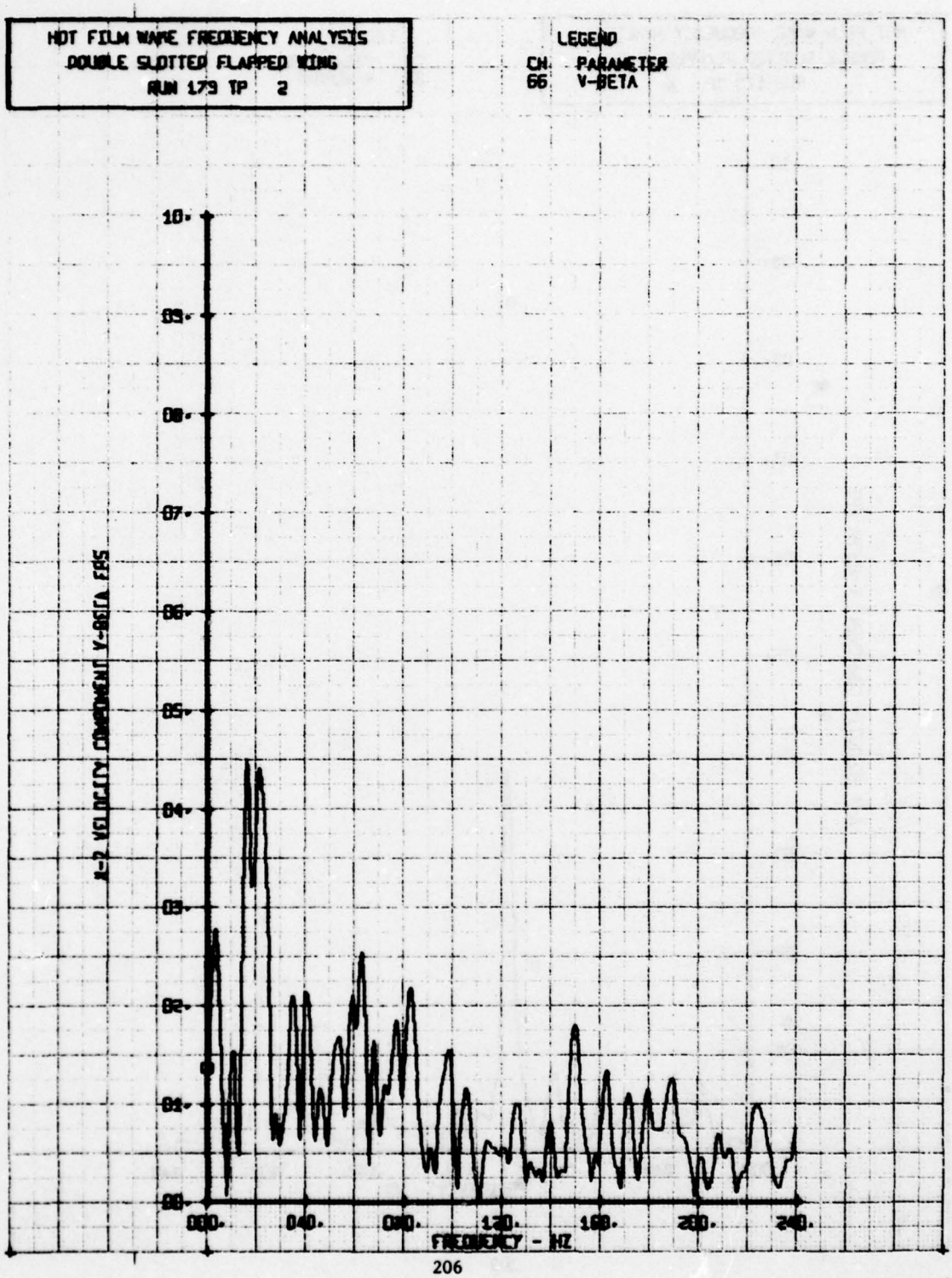
HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 2
LEGEND
CH. PARAMETER
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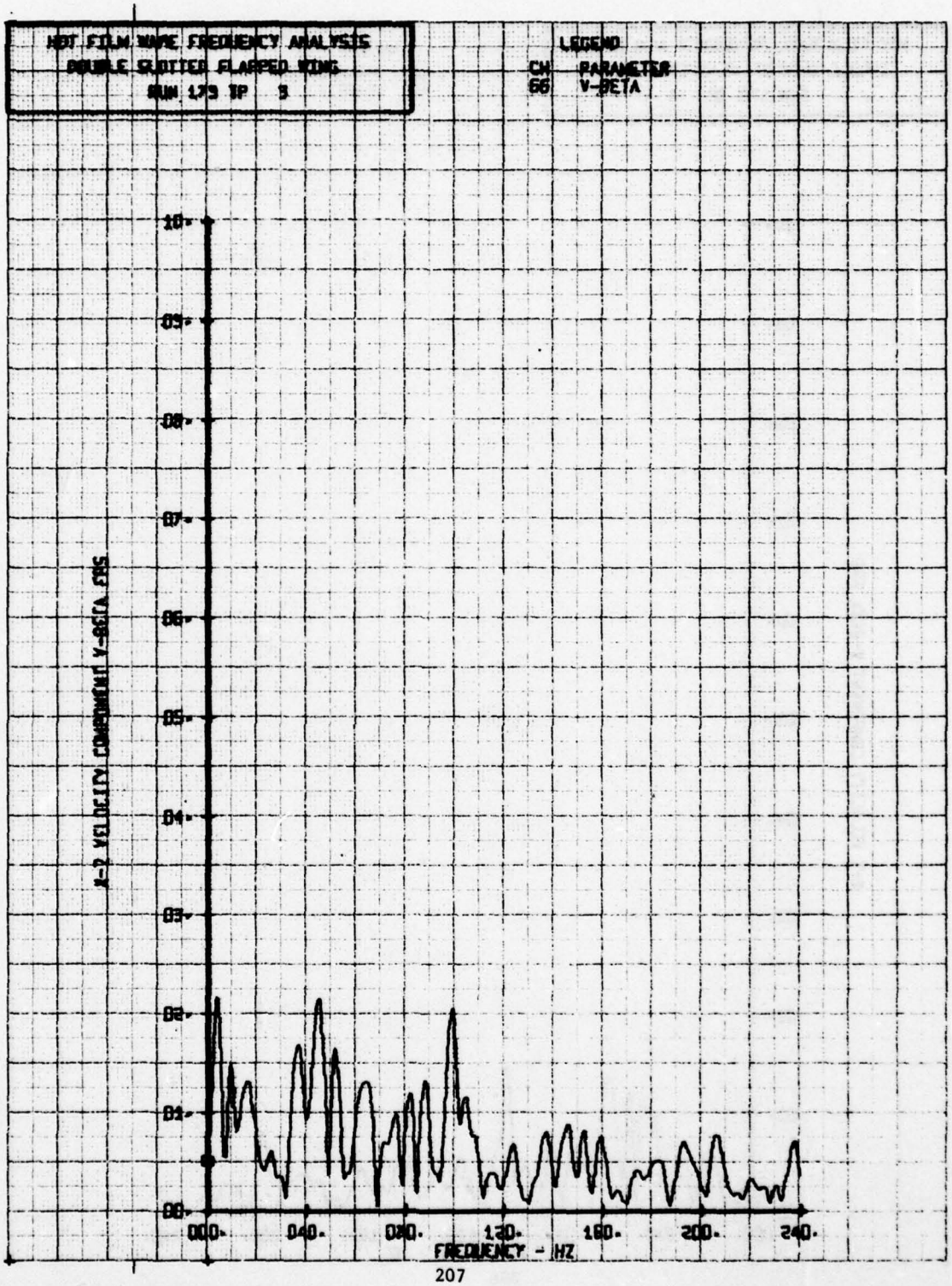
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DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 3
LEGEND
CH PARAMETER
66 V-BETA
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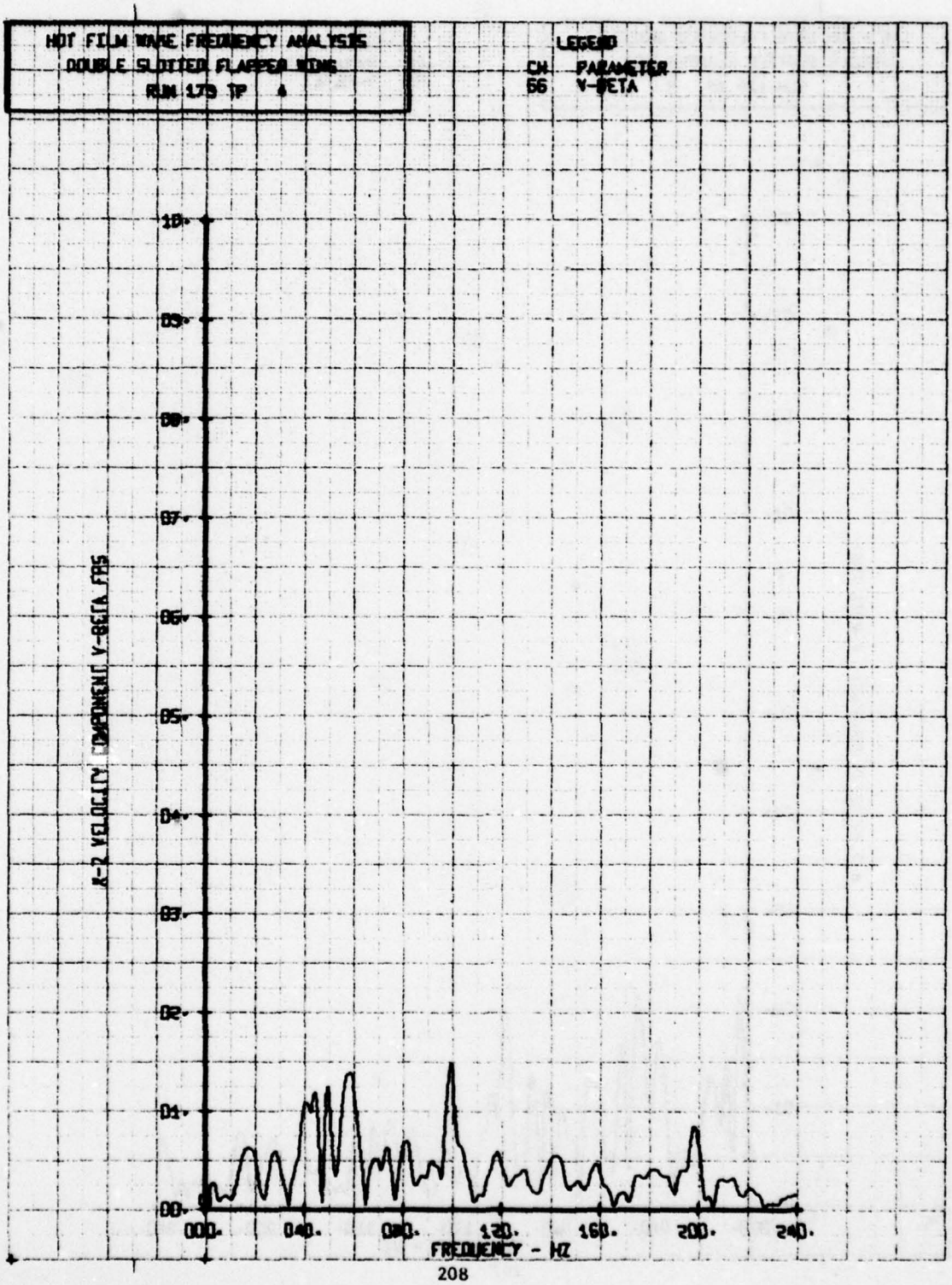
HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 4
LEGEND
CH PARAMETER
56 V-BETA
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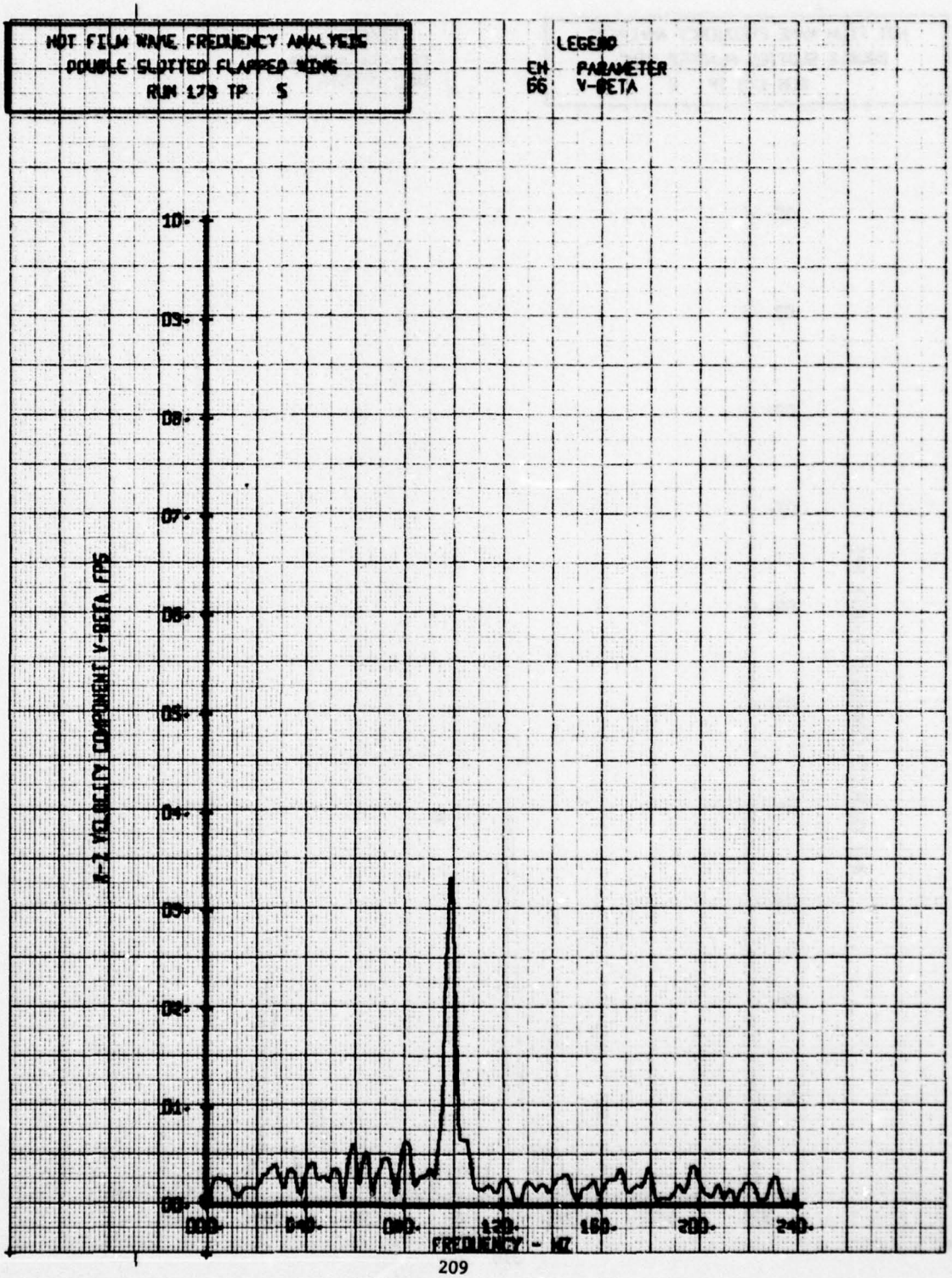
FREQUENCY - HZ
X-2 VELOCITY COMPONENT V-BETA FBS


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 5
LEGEND
CH PARAMETER
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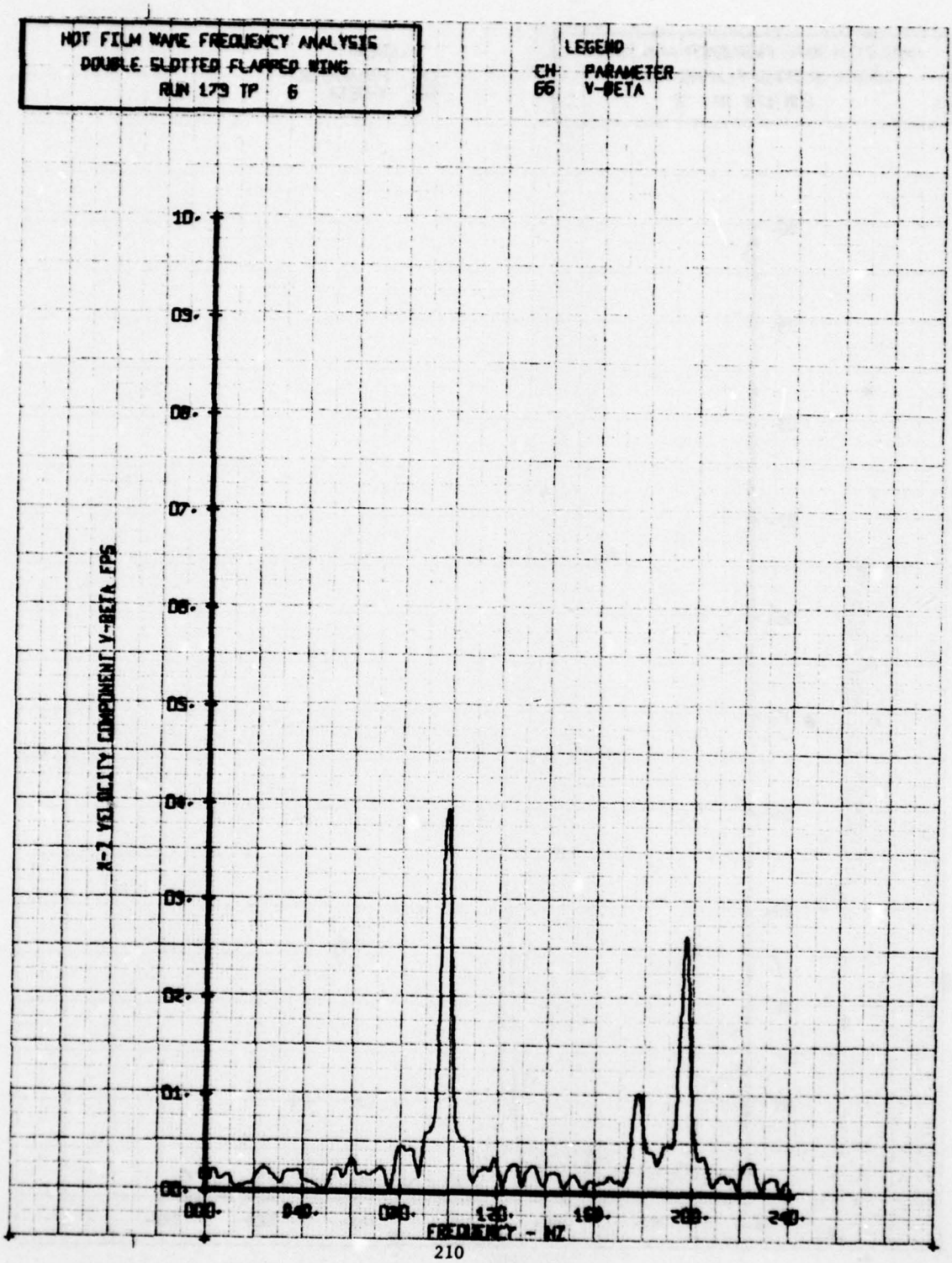
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
DOUBLE SLOTTED FLAPPED WING
RUN 179 TP 6
LEGEND
CH PARAMETER
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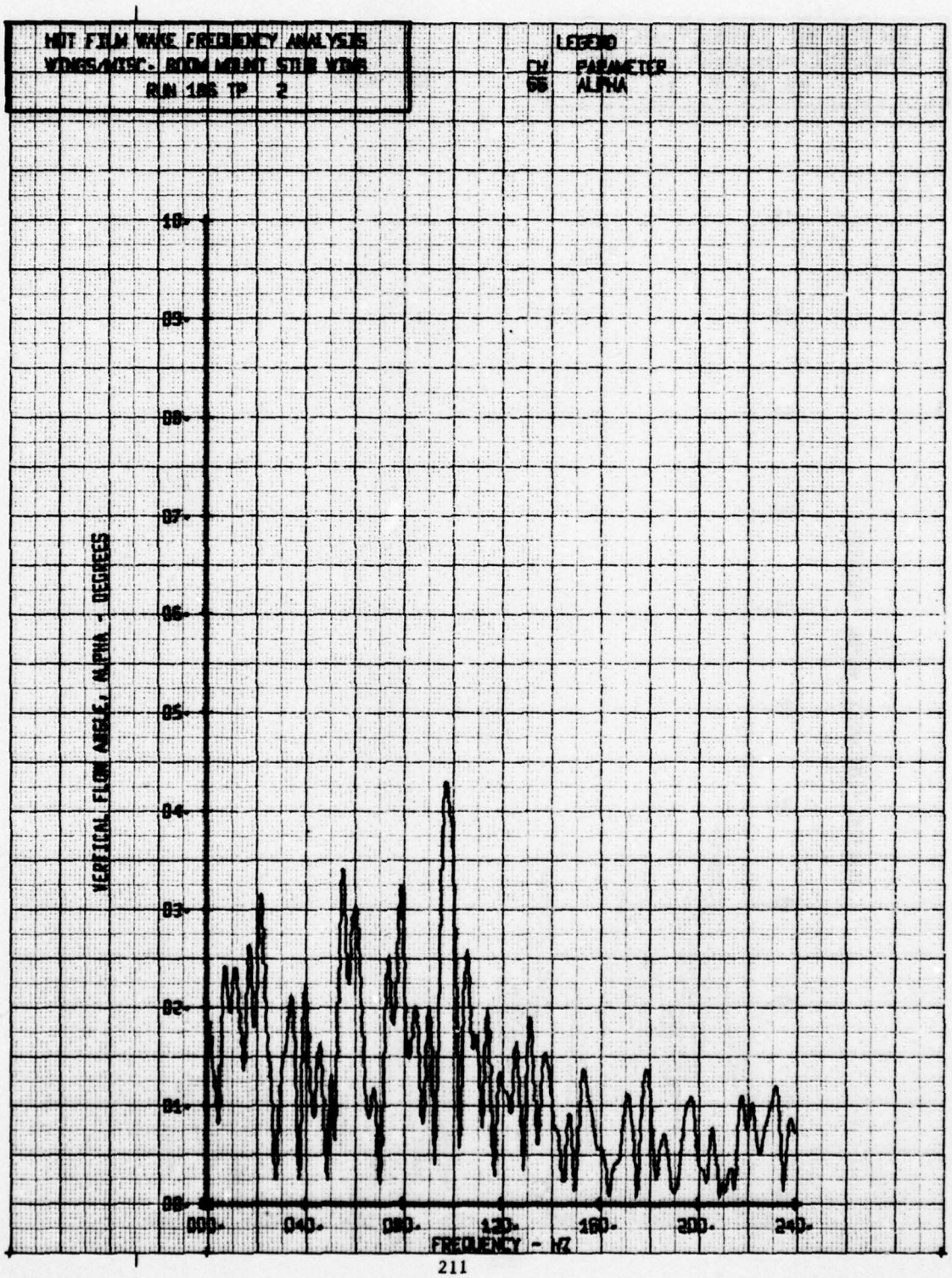
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 2
LEGEND
CH PARAMETER
05 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
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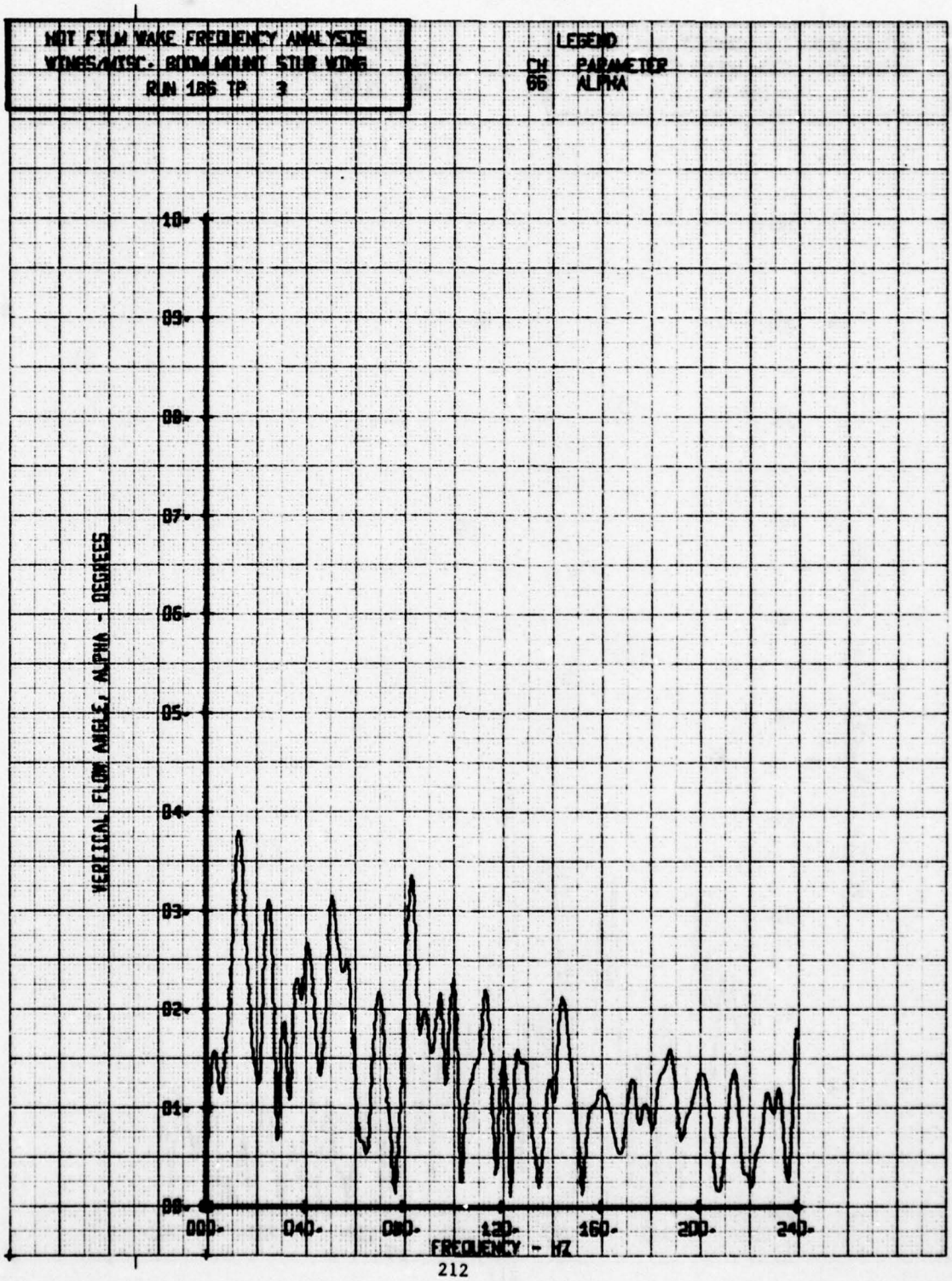
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 3
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
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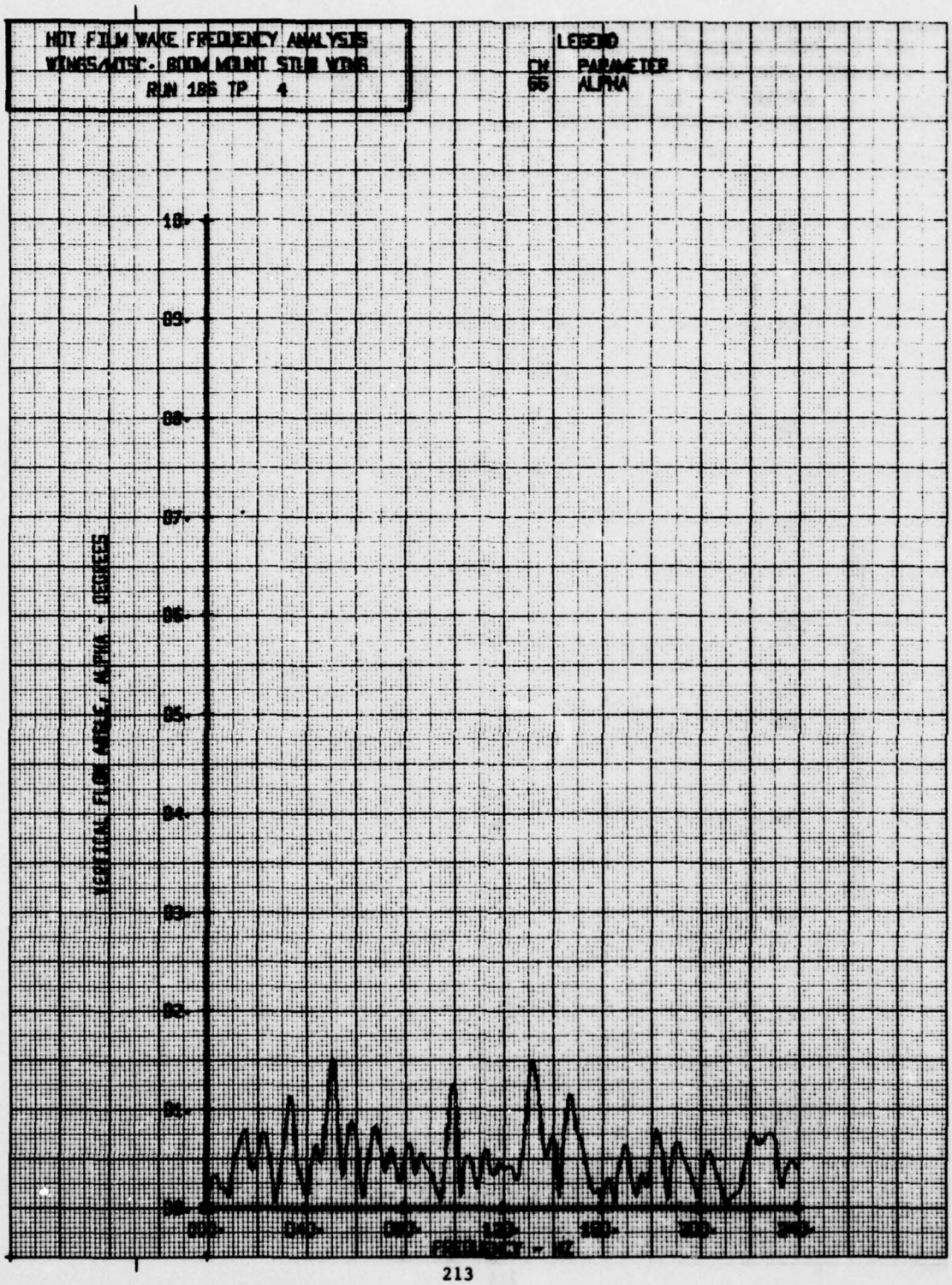
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WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 4
LEGEND
CH PARAMETER
66 ALPHA
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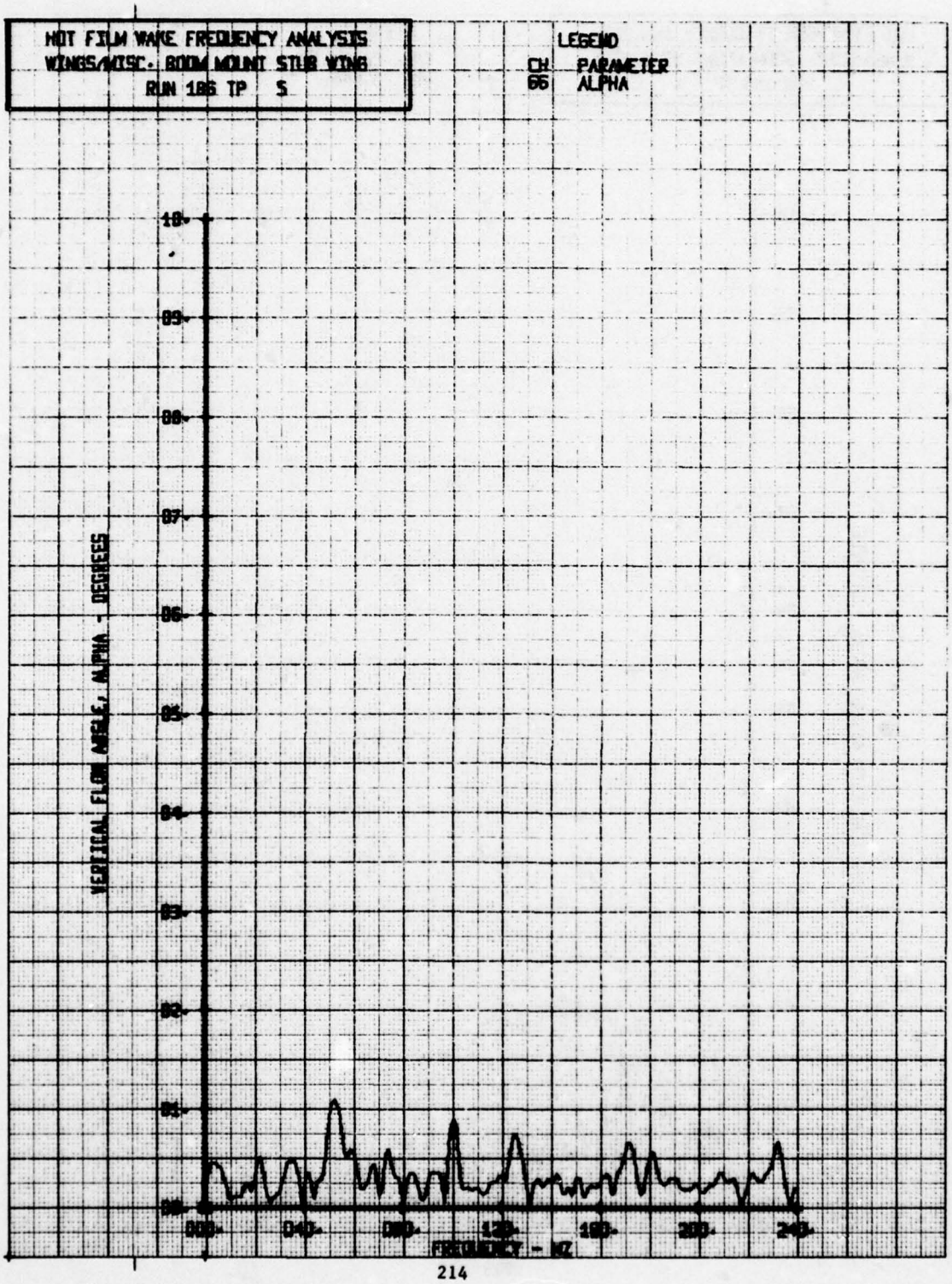
VERTICAL FLOW ANGLE, ALPHA - DEGREES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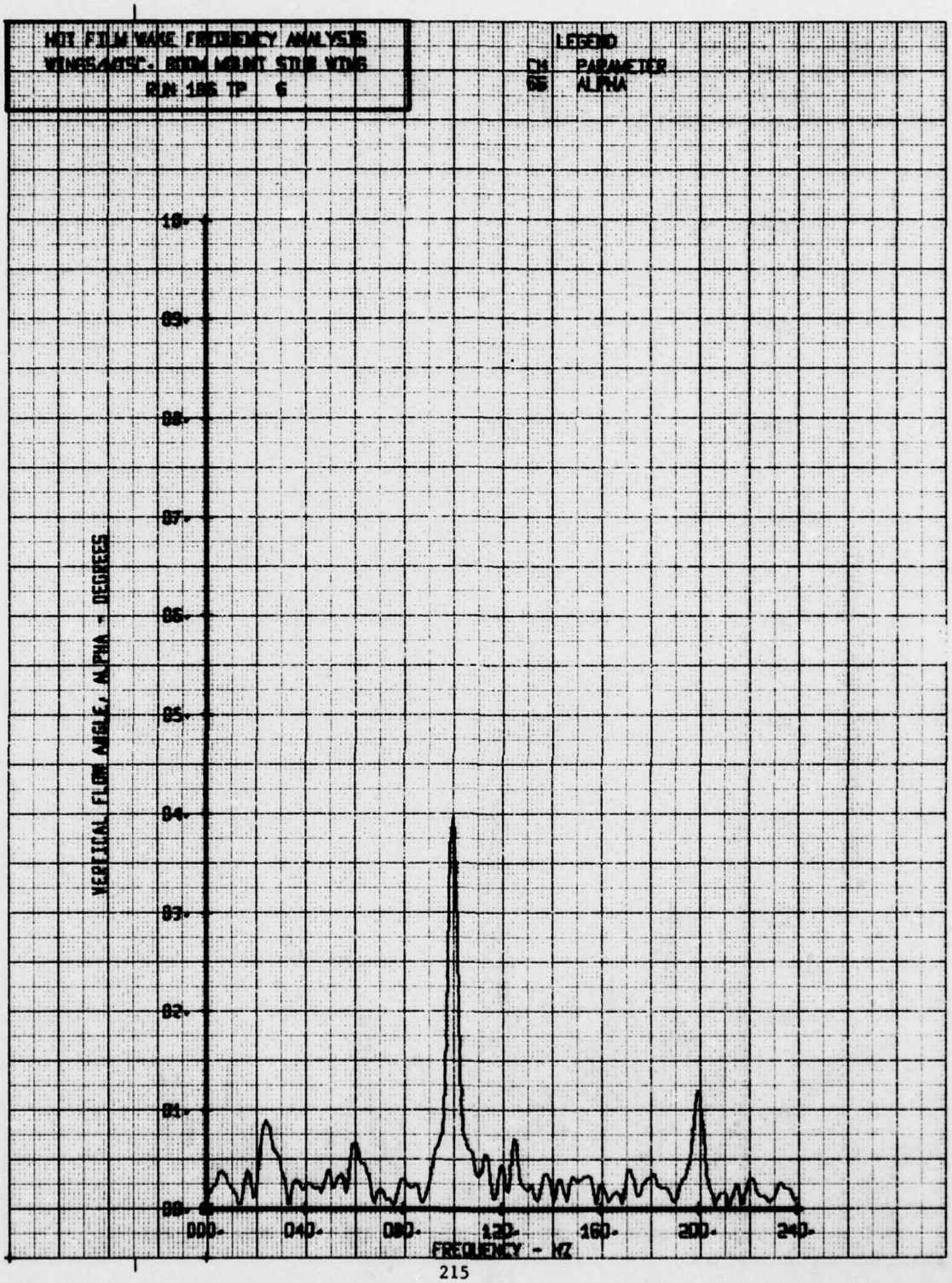
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 5
LEGEND
CH PARAMETER
66 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WING5/MISC. BODY MOUNT STUB WING
RUN 186 TP 6
LEGEND
CH PARAMETER
05 ALPHA
VERTICAL FLOW ANGLE, ALPHA - DEGREES
FREQUENCY - KZ
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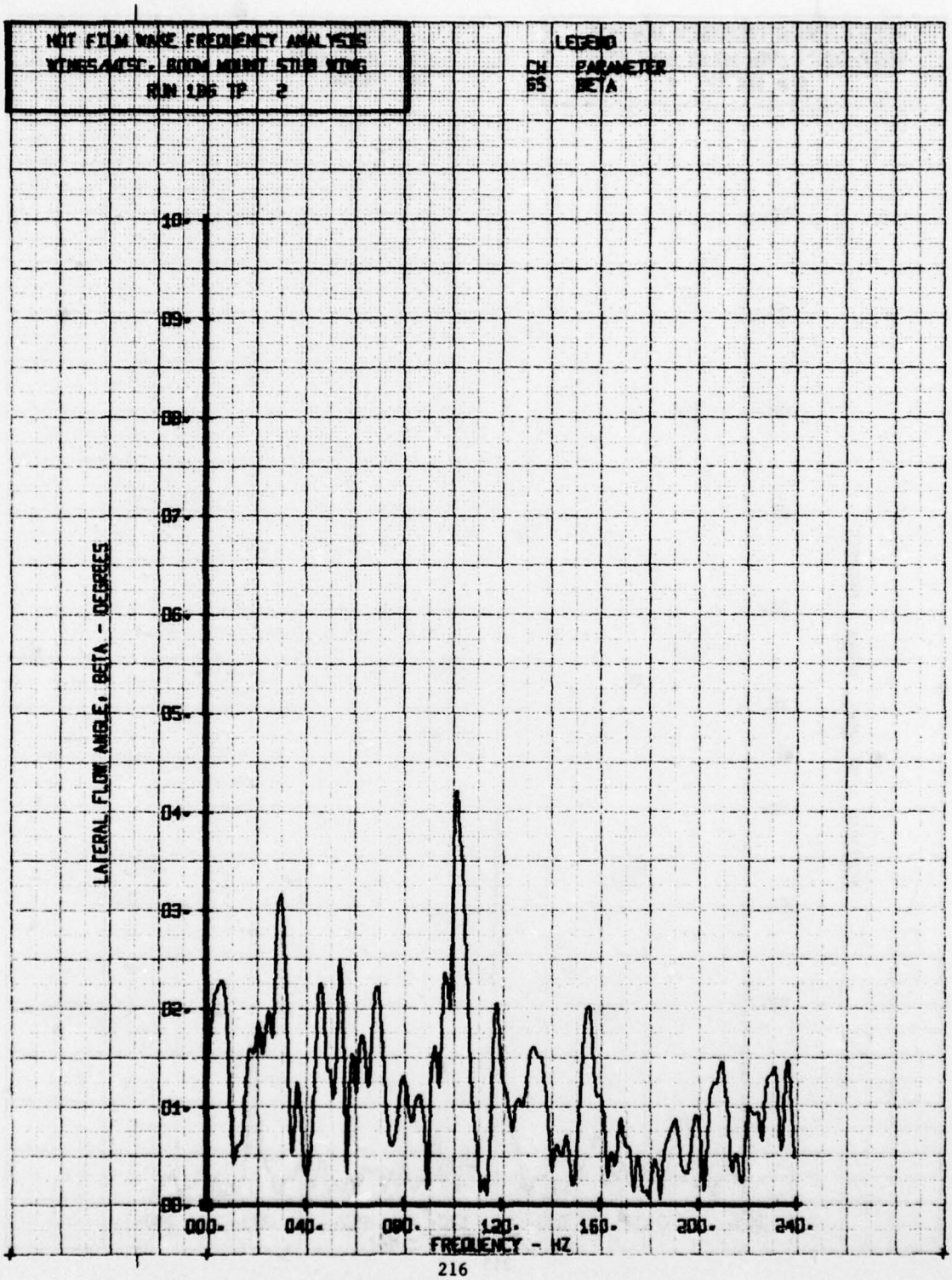
HOT FILM WAKE FREQUENCY ANALYSIS
YOMES4TSC. BOOM MOUNT STUB WING
RUN 186 TP 2
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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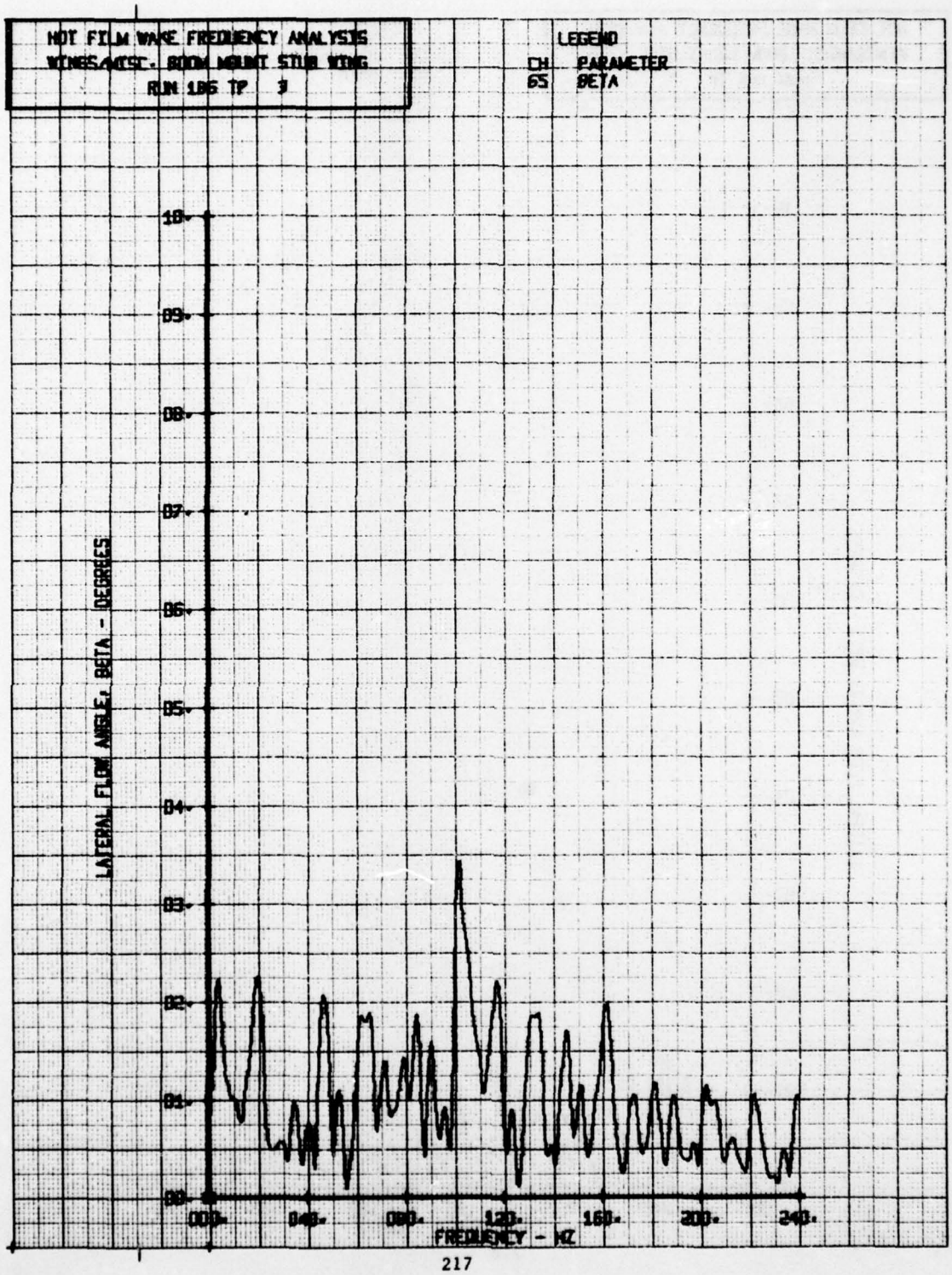
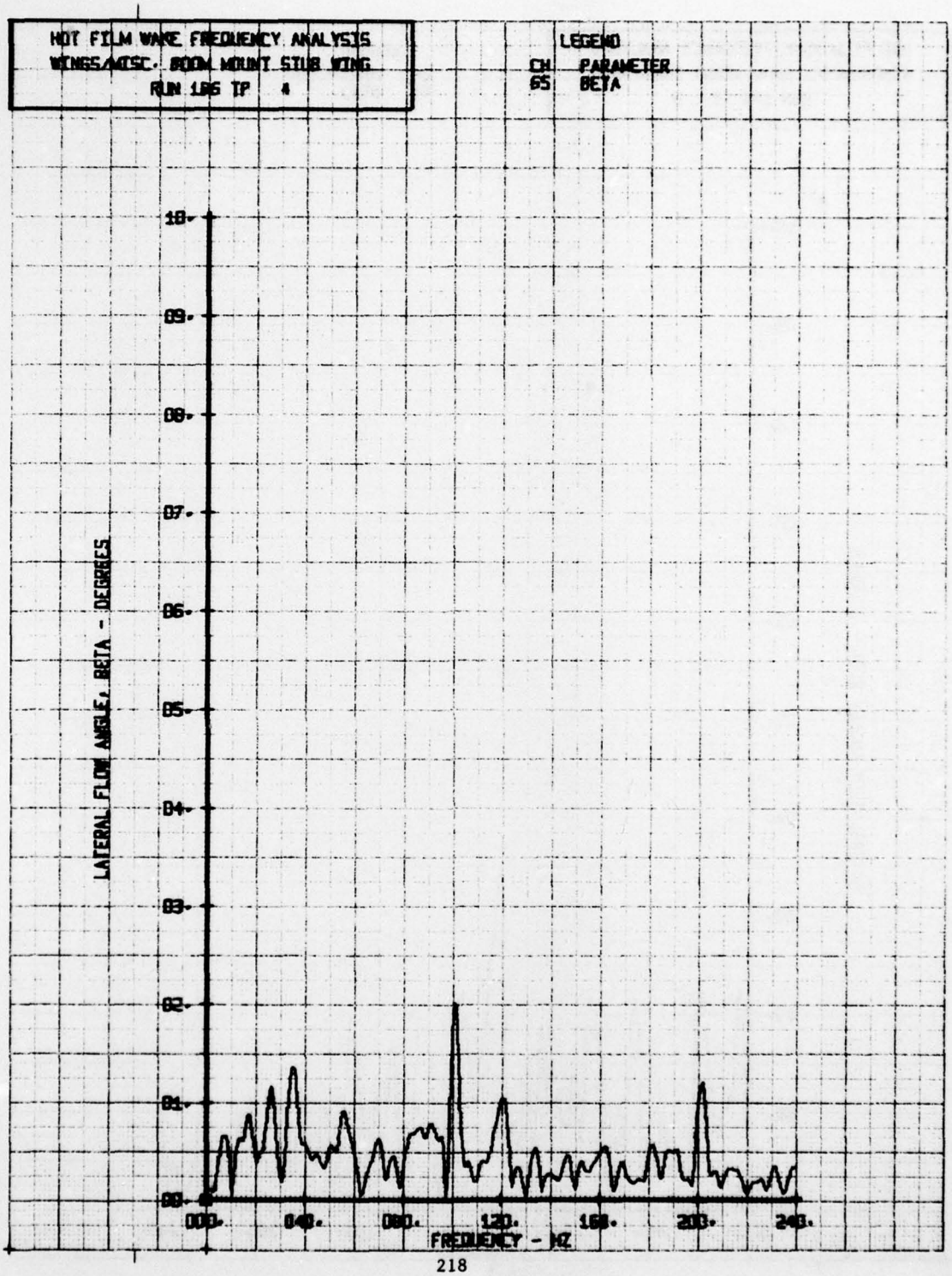
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINES/ACSC. BOOM MOUNT STUB WING
RUN 186 TP 3
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 4
LEGEND
CH PARAMETER
65 BETA
LATERAL FLOW ANGLE, BETA - DEGREES
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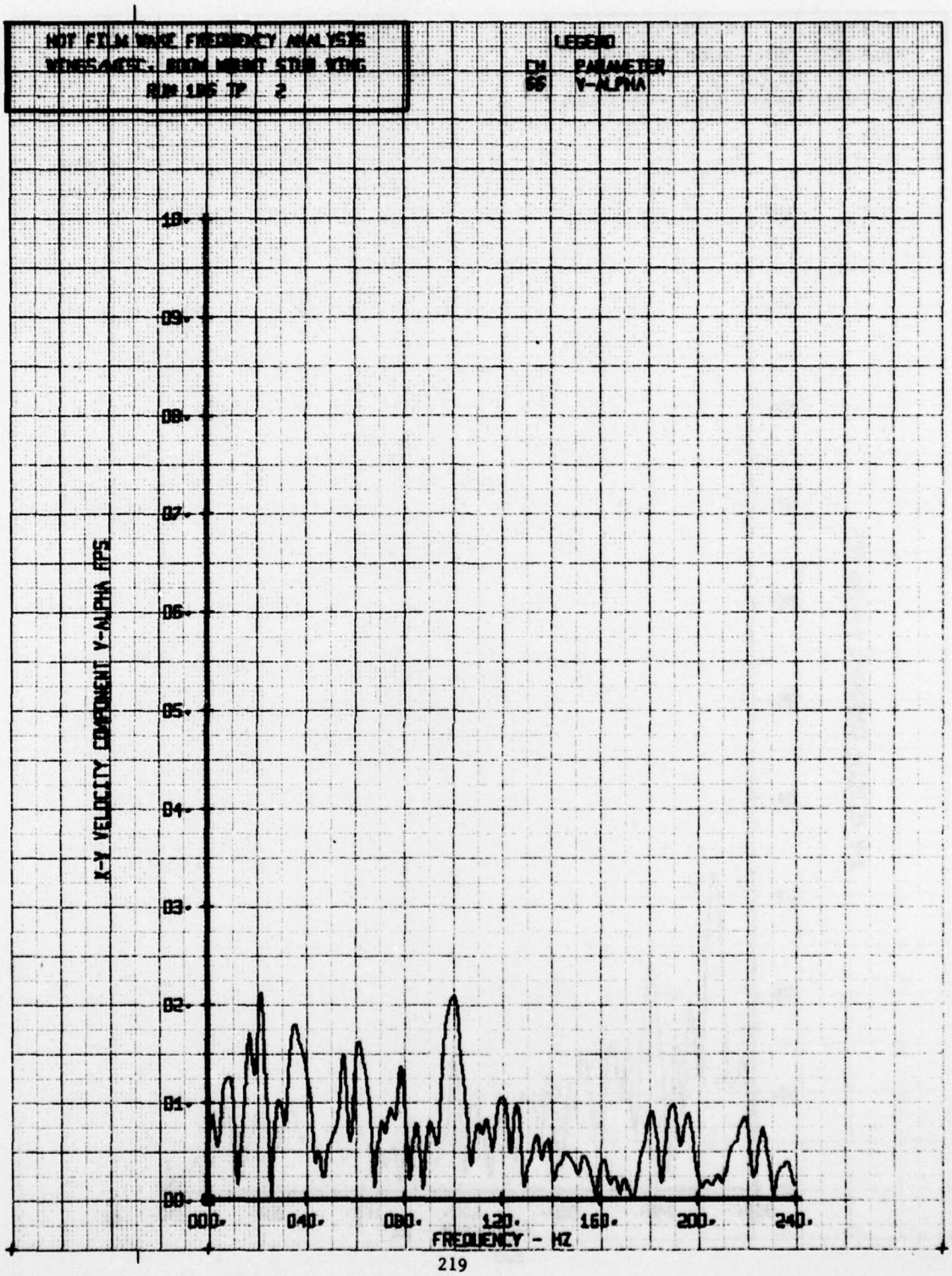
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINDSAMEC., BOOM MOUNT STUB WING
RUN 185 TP 2
LEGEND
CH PARAMETER
86 V-ALPHA
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U-V VELOCITY COMPONENT V-ALPHA RPS
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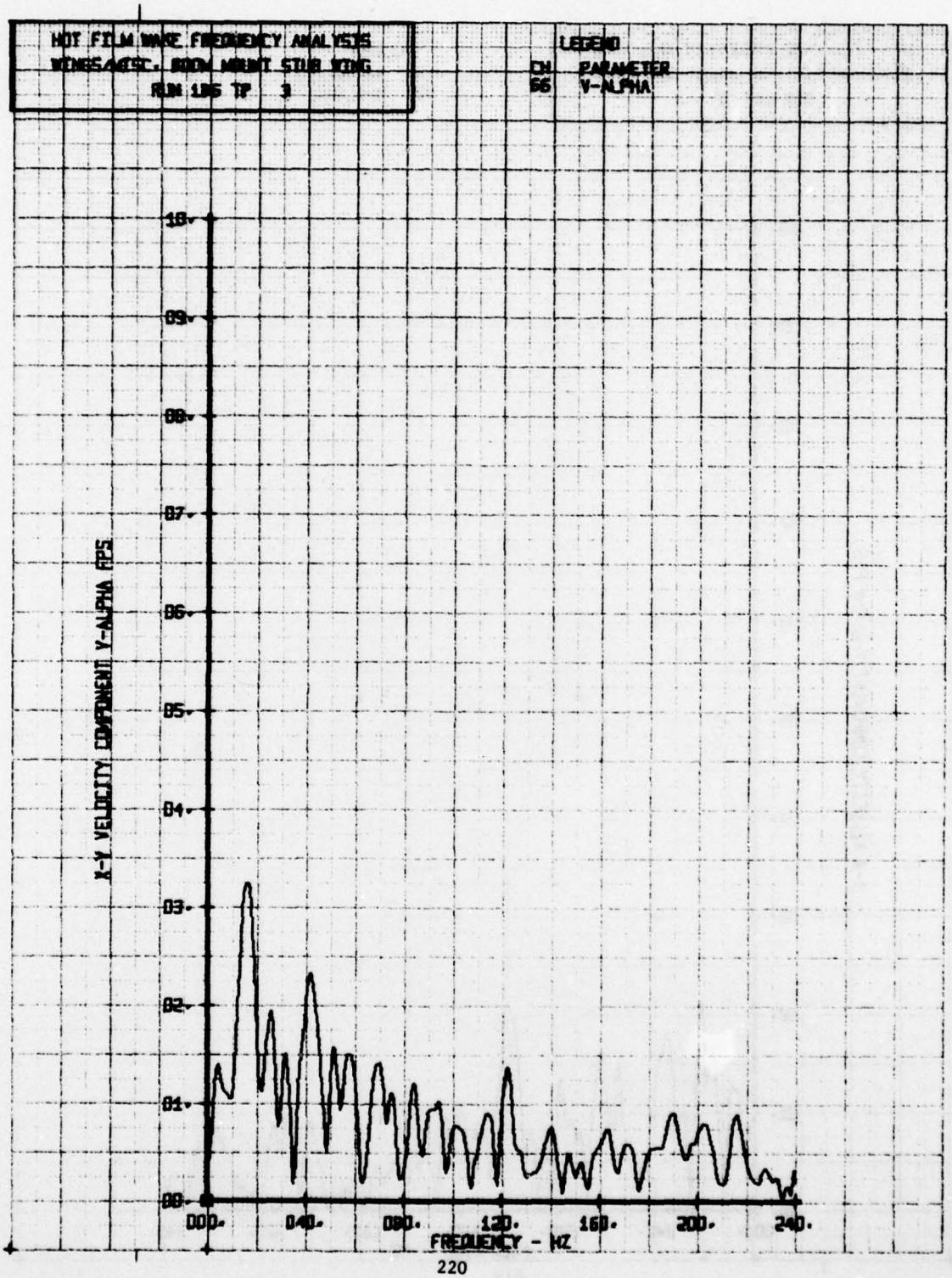
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGSAFTC. BOOM MOUNT STUB WING
RUN 186 TP 3
LEGEND
CH PARAMETER
66 V-ALPHA
X-V VELOCITY COMPONENT V-ALPHA FPS
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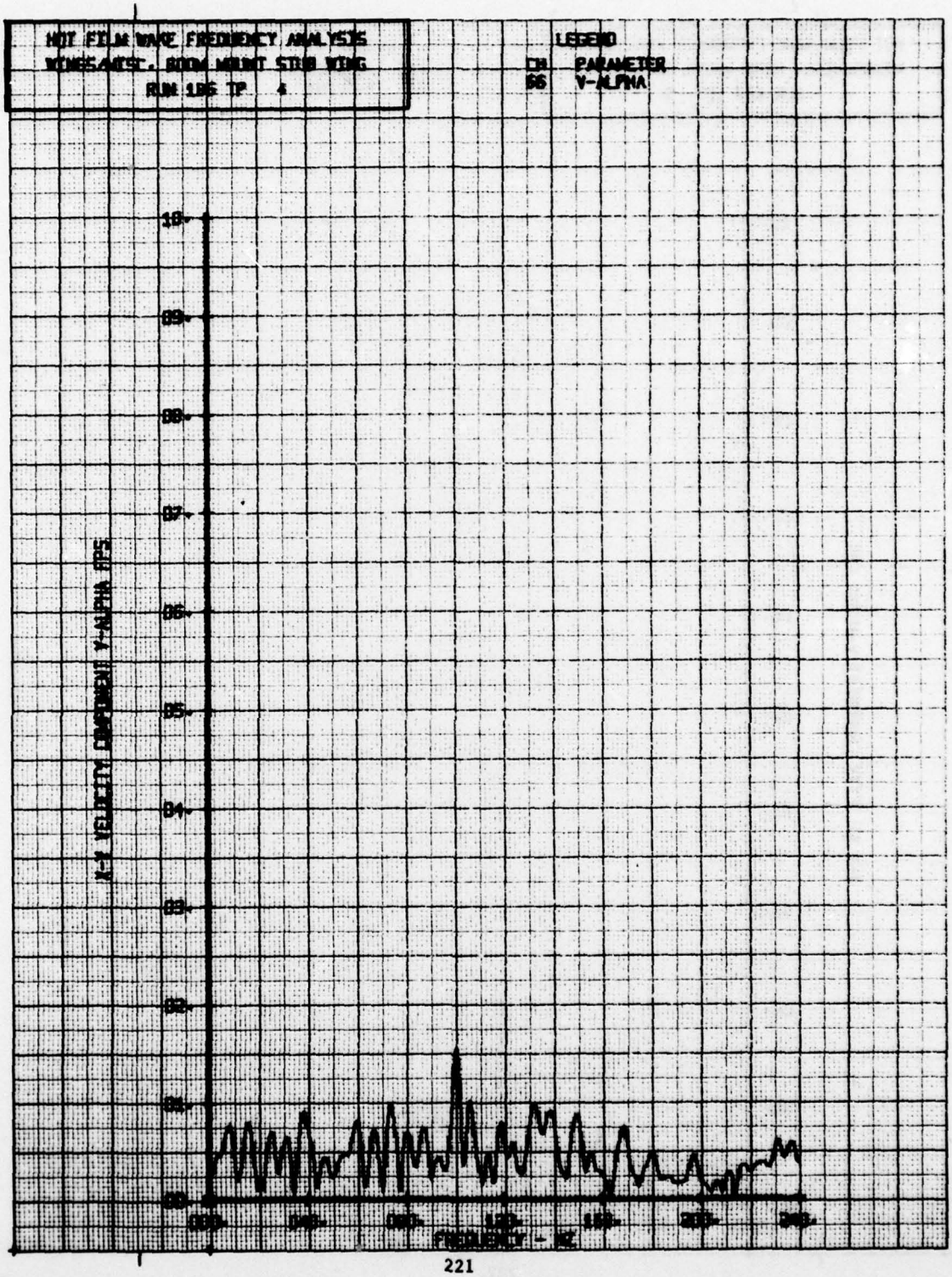
FREQUENCY - HZ


HOT FILM WAVE FREQUENCY ANALYSIS
WINDSAMEC. BOOM MOUNT STUB WING
RUN 186 TP 4
LEGEND
CH PARAMETER
66 V-ALPHA
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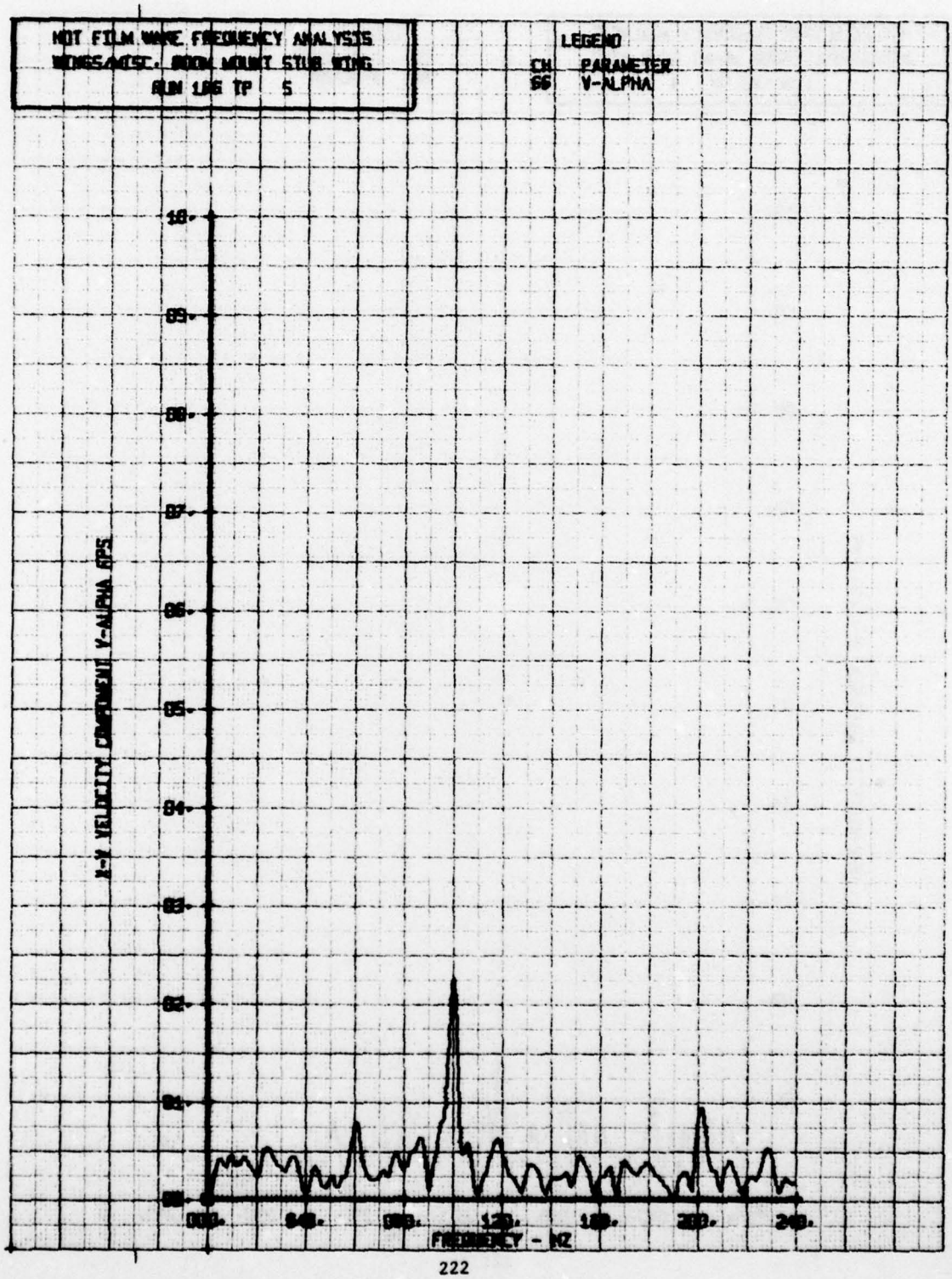
N-1 VELOCITY COMPONENT V-ALPHA FPS
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 5
LEGEND
CH PARAMETER
56 V-ALPHA
90.
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V-V VELOCITY COMPONENT V-ALPHA FPS
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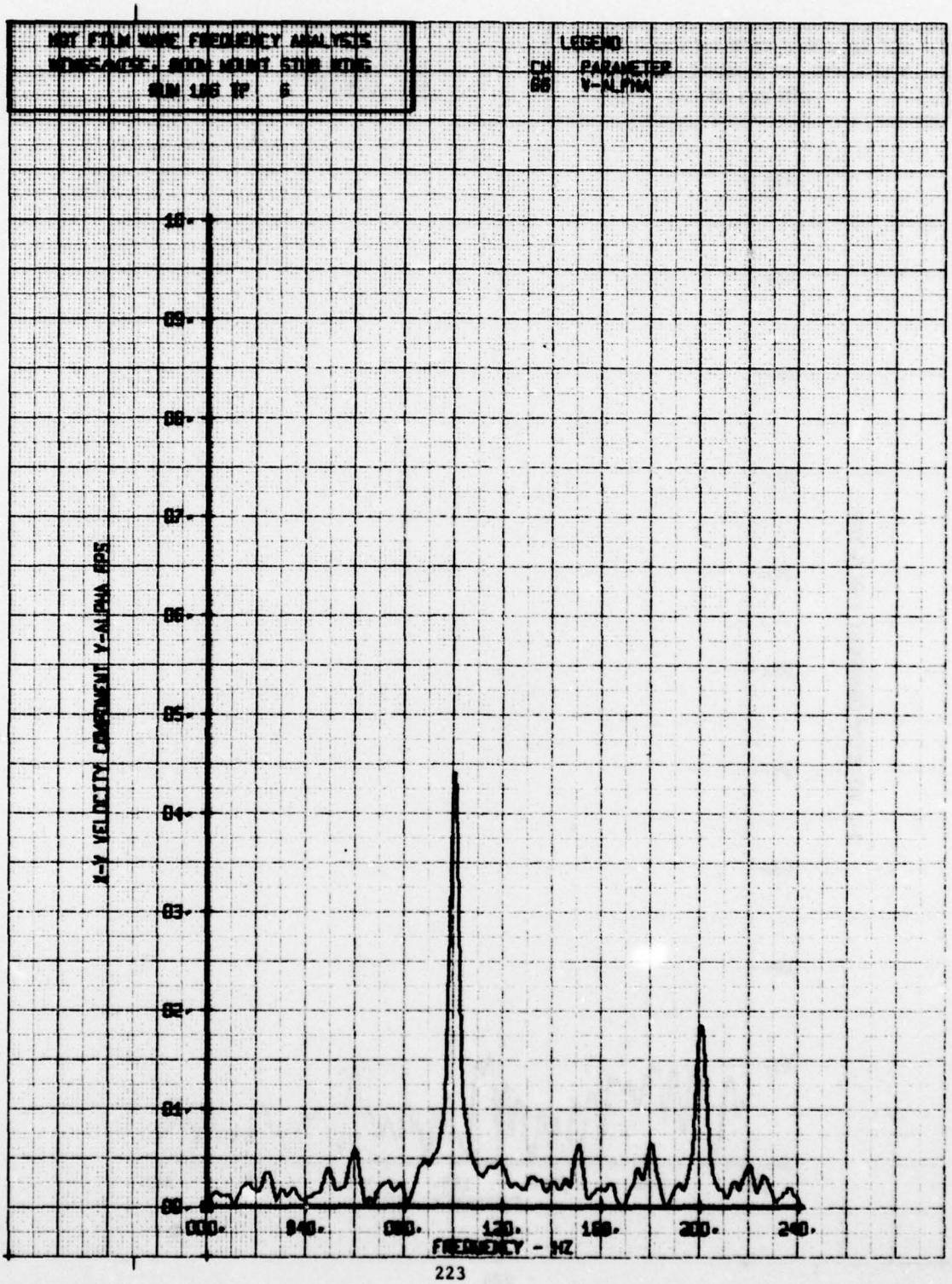
FREQUENCY - HZ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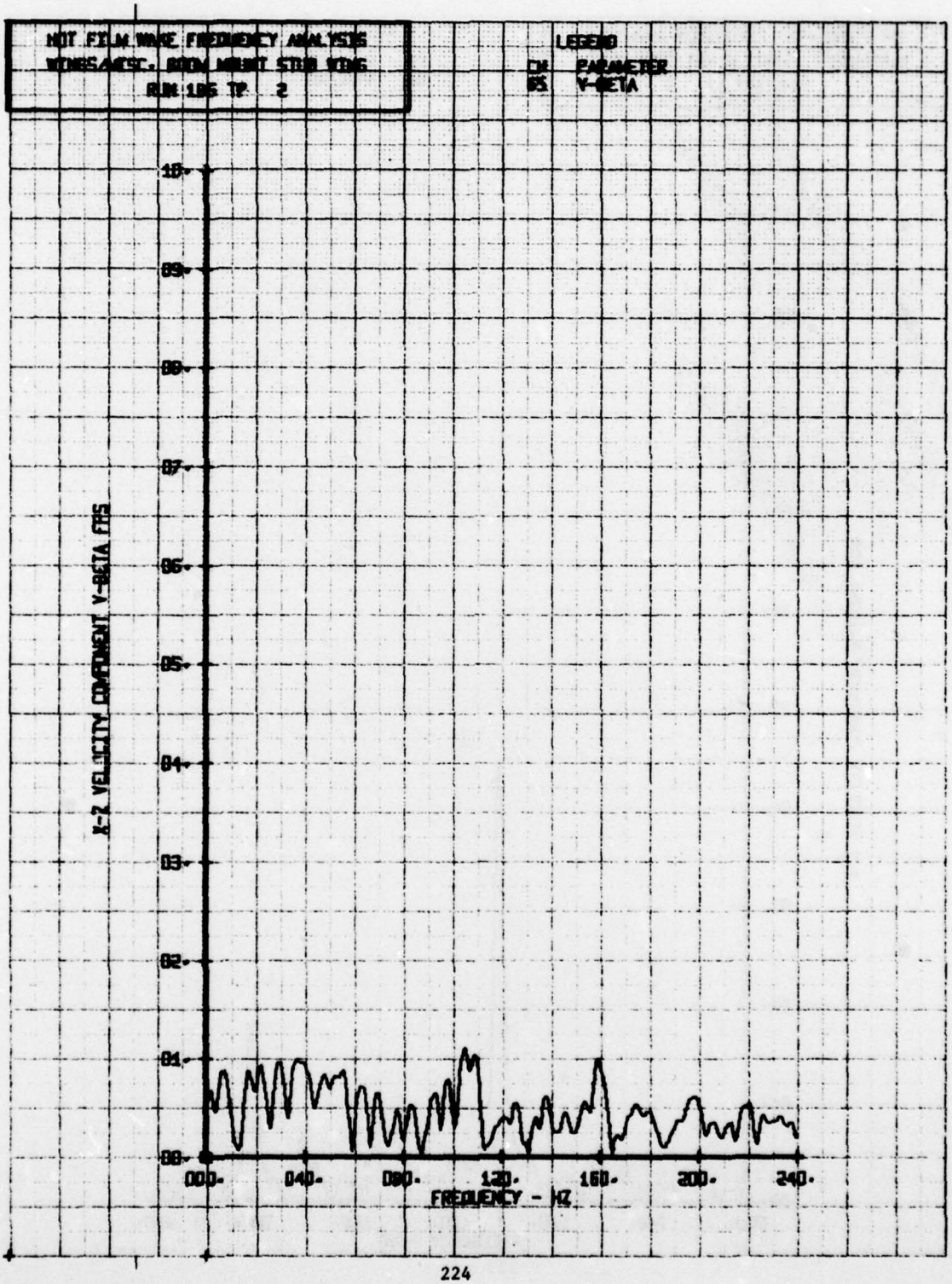
LEGEND
CH PARAMETER
Y-ALPHA
X-Y VELOCITY COMPONENT Y-ALPHA RPS
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINDSAMST. BODY MOUNT STUB WING
RUN 195 TP 2
LEGEND
CH PARAMETER
05 V-BETA
X-2 VELOCITY COMPONENT V-BETA FPS
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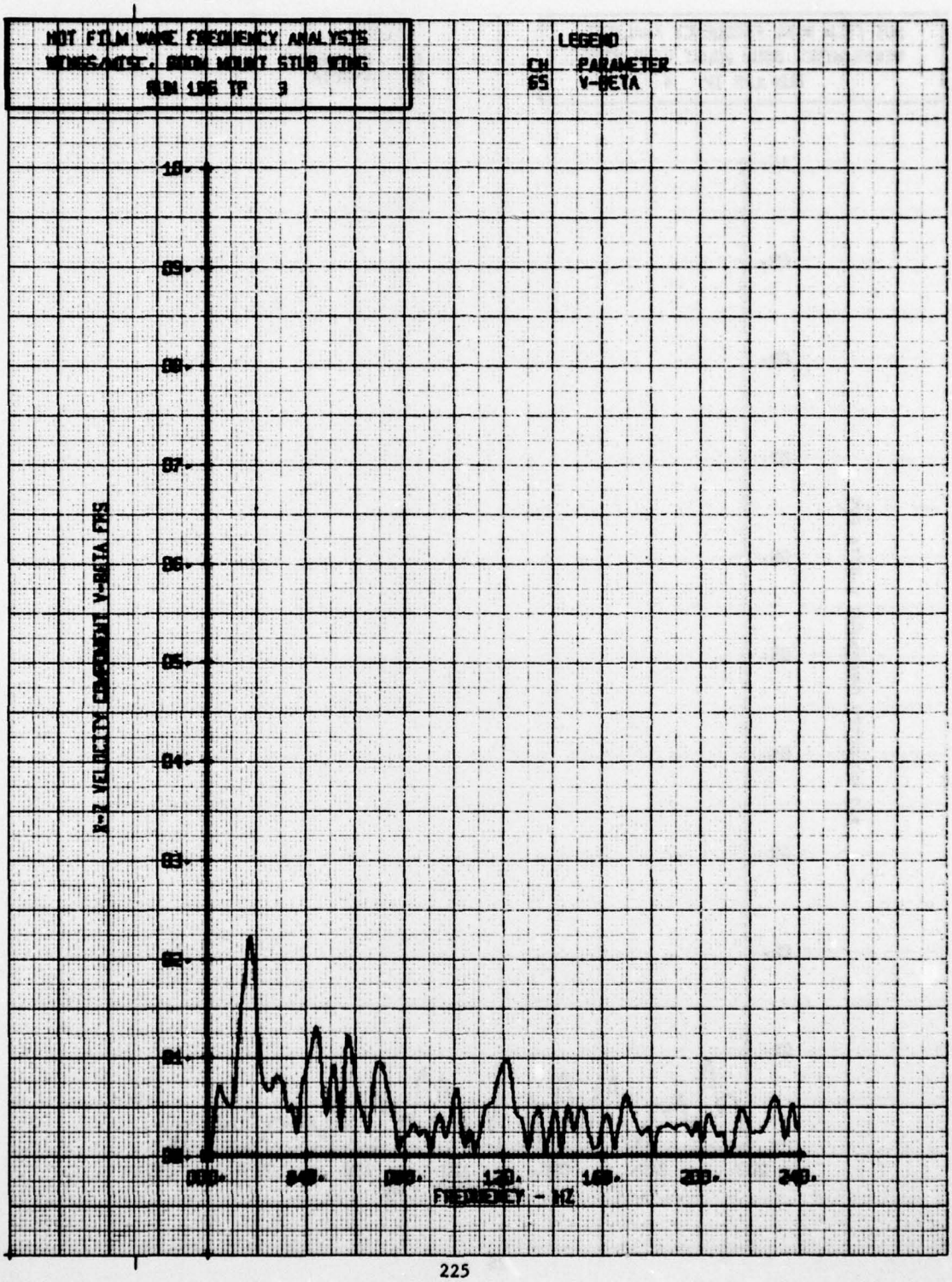
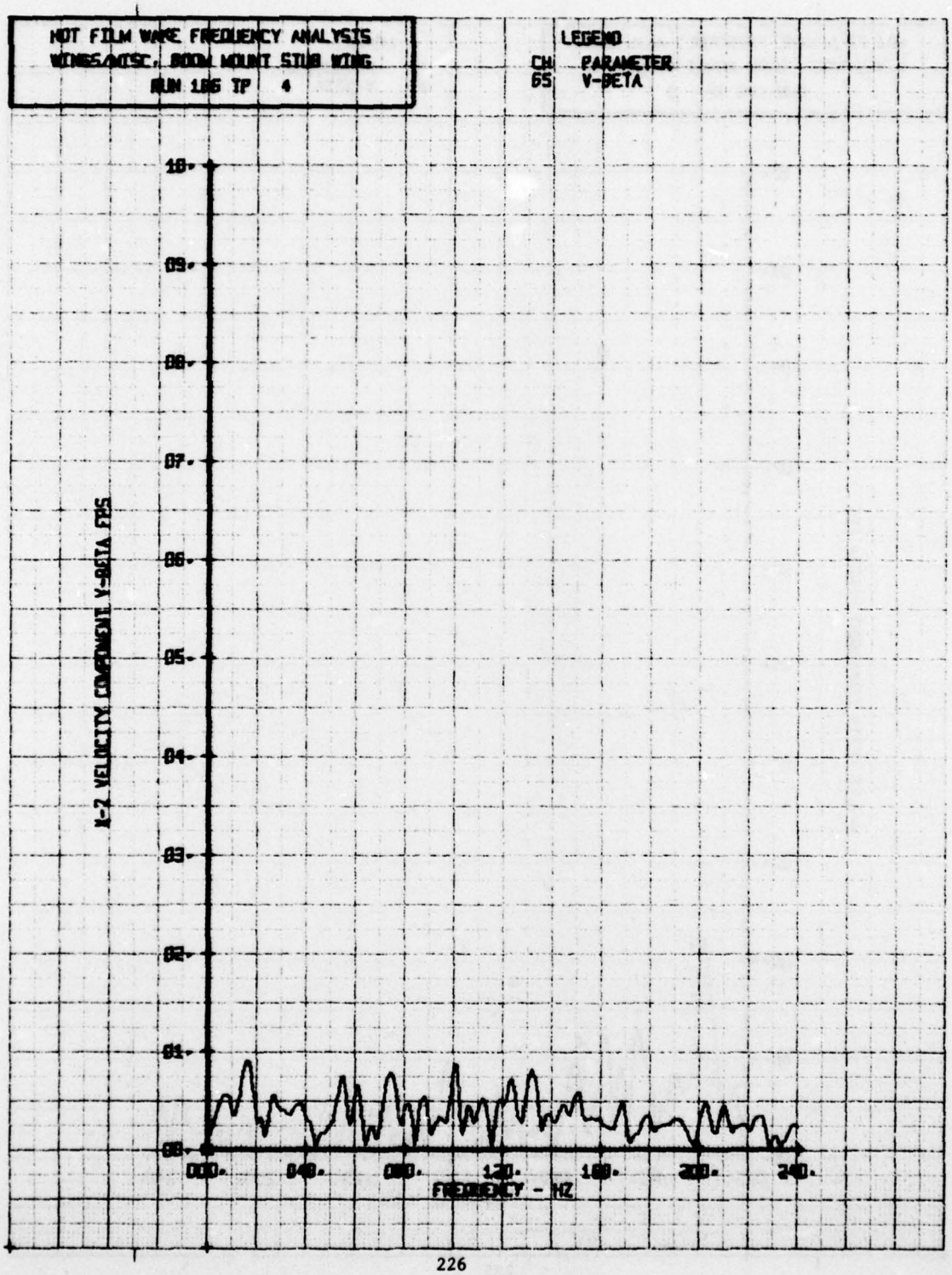
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. SWEPT MOUNT STUB WING
RUN 196 TP 3
LEGEND
CH PARAMETER
65 V-BETA
K-Z VELOCITY COMPONENT V-BETA FMS
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 4
LEGEND
CH PARAMETER
65 V-BETA
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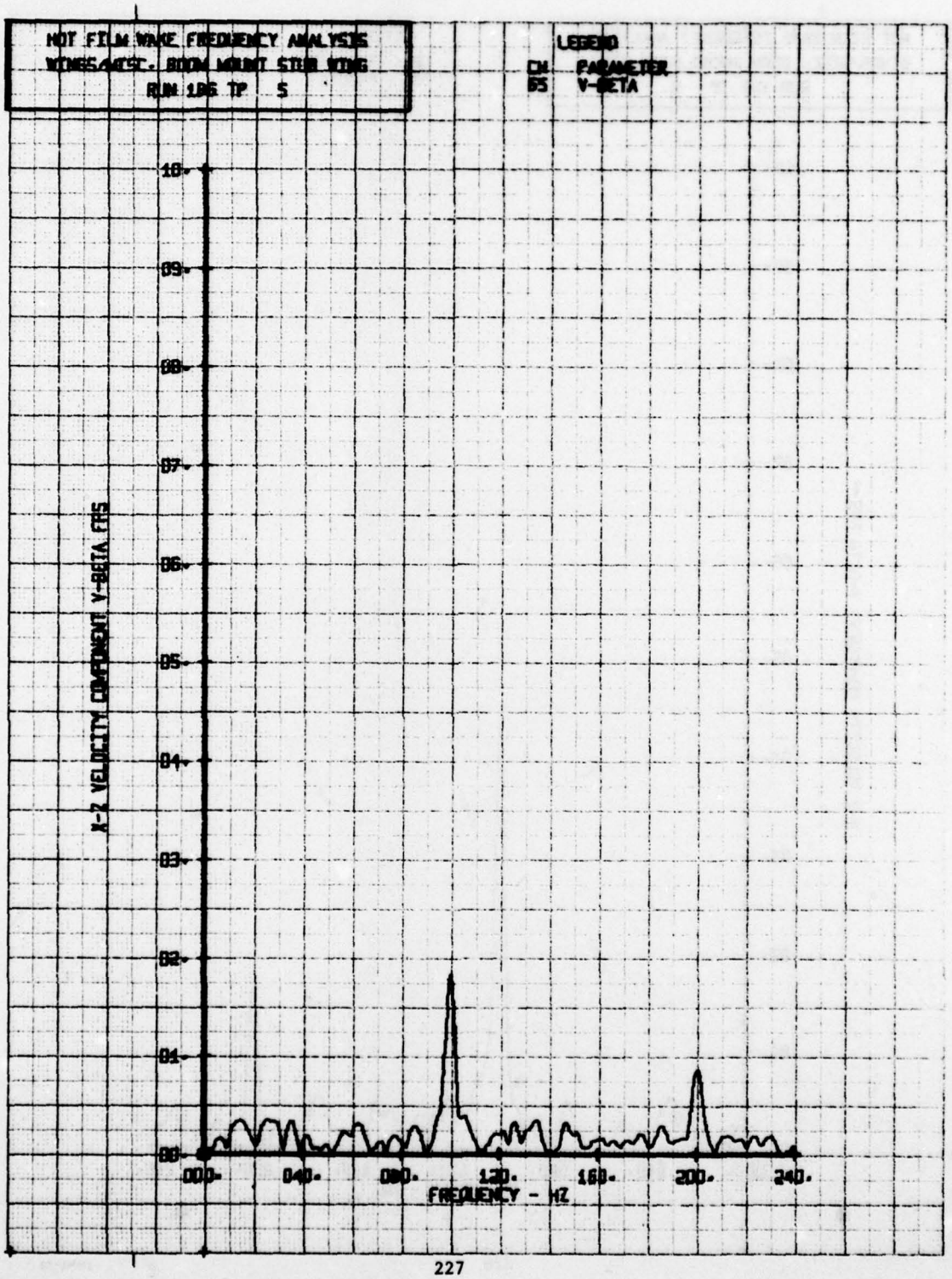
HOT FILM WAKE FREQUENCY ANALYSIS
WINDSHEAR. BOOM MOUNT STUB WING
RUN 186 TP 5
LEGEND
CH PARAMETER
05 V-BETA
X-2 VELOCITY COMPONENT V-BETA FPS
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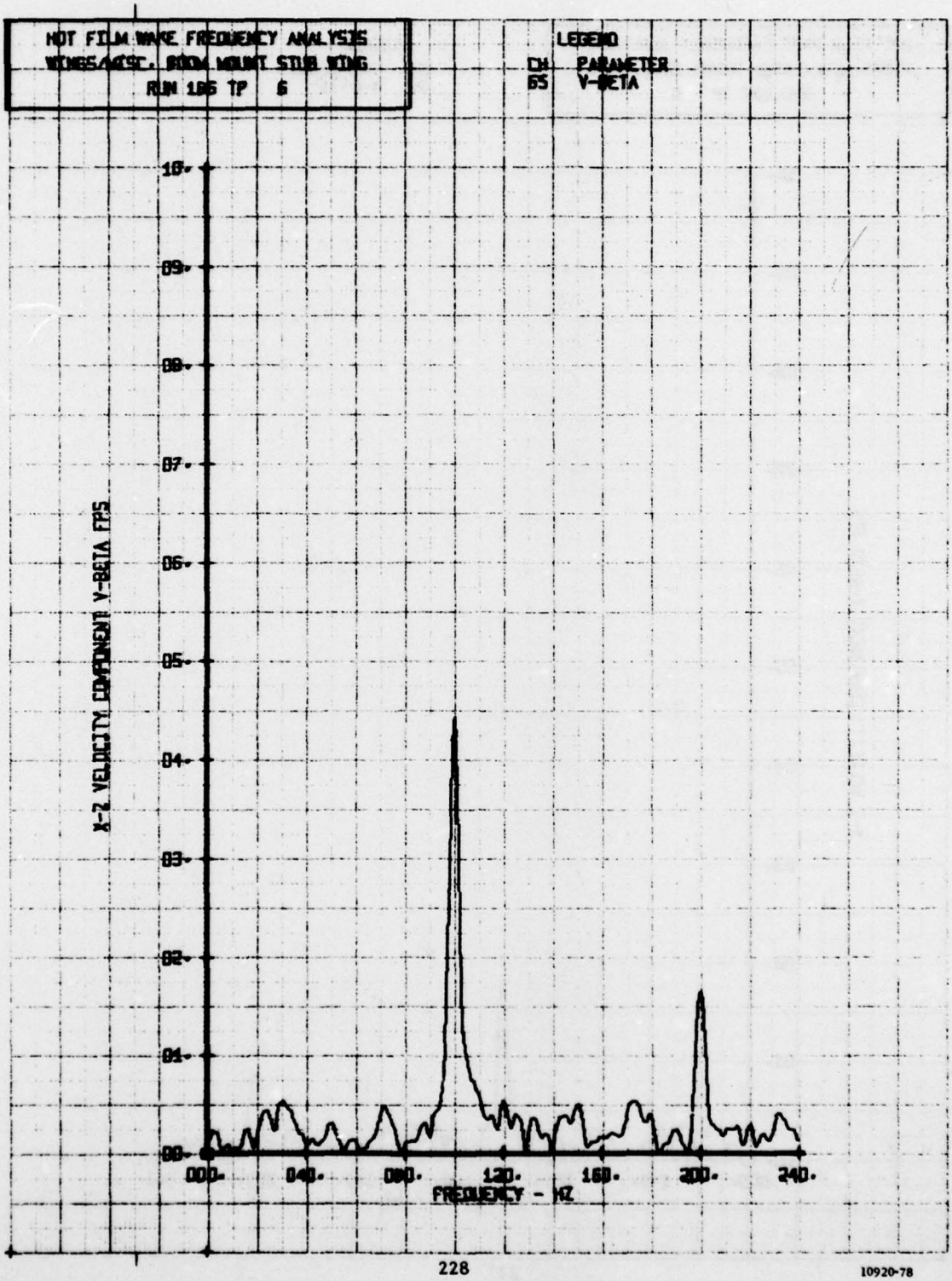
FREQUENCY - HZ


HOT FILM WAKE FREQUENCY ANALYSIS
WINGS/MISC. BOOM MOUNT STUB WING
RUN 186 TP 6
LEGEND
CH PARAMETER
65 V-BETA
X-Z VELOCITY COMPONENT V-BETA FPS
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